

MARINE REVIEW

VOL. XXI.

Published every Thursday at 418-19 Perry-Payne Bldg., by the Marine Review Pub. Co.

CLEVELAND, O., FEB. 15, 1900.

Subscription \$2.00 a year.
Foreign \$3.50 a year.

No. 7

SUPERVISING INSPECTORS.

THEY CHANGE THE CODE OF SIGNALS NOW IN USE BETWEEN DECK AND ENGINE ROOM ON STEAMERS OF THE GREAT LAKES—OTHER MATTERS ACTED UPON AT THE ANNUAL MEETING IN WASHINGTON.

WASHINGTON OFFICE MARINE REVIEW, 1345 PENNSYLVANIA AVE.,
WASHINGTON, Feb. 14, 1900.

Probably the most important action of the United States board of supervising inspectors of steam vessels at their annual meeting, closed in this city a few days ago, was the change in the code of signals between deck and engine room on steamers of the great lakes. It will be remembered that this code of signals was last winter made the subject of extended correspondence between the supervising inspector-general and Pickands, Mather & Co. of Cleveland, who control a very large fleet of steam vessels on the lakes. The special point of interest in this correspondence was the so-called strong backing signal, which according to the code was one long whistle or four bells. But it was pointed out that this signal was ignored and that on nearly all vessels the two-whistle signal was used when it was desired to back strong. As a result of this discussion the board has provided a new code of signals and here they are side-by-side with the old code:

NEW CODE.

1 whistle or 1 bell.....Go ahead.
1 whistle or 1 bell.....Stop.
2 whistles or 2 bells.....Back.
4 whistles or 4 bells.....Strong.
4 whistles or 4 bells.....All right.
Two whistles or two bells shall always mean back, irrespective of other signals previously given.

OLD CODE.

1 whistle or bell.....Go ahead.
1 whistle or bell.....Stop.
2 whistles or bells.....Back.
3 whistles or bells.....Check.
1 long whistle or 4 bells.....Strong.
1 long whistle or 4 bells.....All right.
Two whistles or two bells, when the engine is working ahead, will always be a signal to stop and back strong.

In regard to search lights it was resolved by the board that masters, mates, and pilots of all vessels be required to exercise due caution in the use of same so as not to throw the rays of the light into the pilot house of passing steamers. Licensed officers are notified that in case of the loss of their license through any cause, they can obtain a certificate of such loss from local inspectors to take the place of the lost license, which certificate will hold good until date of expiration of the lost or destroyed license; or until grade of license is raised, in which case the certificate may be surrendered, and new license issued indicating the new grade.

Manufacturers of boiler tubes will hereafter be required to furnish copies of reports of physical tests of every order for tubes to be used in marine boilers, to the boiler maker using the same, and a similar copy to the supervising inspector-general, to be filed in his office. No connection between the shell of the boiler and mud drum exceeding 6 inches in diameter will hereafter be allowed.

Another new rule provides that each and every steam vessel applying for inspection on and after July 1, 1900, shall be fitted with a bilge pipe connecting by a suitably marked valve with the main bilge pump in the engine room, and each compartment of all steam vessels shall be fitted with a suitable sounding pipe. It is also provided that all double-ended ferry steamers and steamers similarly constructed shall have a steam whistle both fore and aft of the smoke pipe; or if only one whistle is used, said whistle shall be placed on the side of the smoke pipe, so that the steam, when the whistle is blown, can be seen from either end of the steamer.

The following-named devices were approved by the board, and have also received the approval of the secretary of the treasury: Carpentier automatic safety stop valve, presented by John Twohy of Norfolk, Va.; Utica pop safety valve, presented by the Utica Steam Gauge Co. of Frankfort, N. Y.; tanks or air chambers, presented by Capt. J. W. Shackford of New York, formed of reindurated wood and placed in boats of steam vessels constructed abroad; corrugated metallic lifeboat, presented by Thomas Drein & Sons, Wilmington, Del., when fitted with suitable bottom boards of usual form to prevent the bulging of the floor plates by falling bodies.

The board approved coil and pipe boilers presented by the following named persons and firms, when such boilers are constructed in all their parts of wrought iron, steel or cast steel, in the manner as provided in the general rules of the board: American Fire Engine Co., Cincinnati; Barr & Creelman, Rochester, N. Y.; W. J. Boland, Chicago; Ed Cheetham, Detroit; International Power Co., Providence, R. I.; Geo. E. Jones, Newark, N. J.; W. E. Jenkins and A. Stokey, Tacoma, Wash.; Geo. Krill & Bro., Baltimore; Chas. Kellogg, Athens, Pa.; Harry Lawson, Jersey City, N. J.; S. C. Lighthill, Allegheny, Pa.; Geo. Lawley & Son Corporation, Boston; W. S. Lowe, Lima, O.; Joseph C. Lesley, St. Albans, Vt.; Walter MacFarlane, Seattle, Wash.; Thomas F. Morrin, Brooklyn; Archibald Pifer, Braidentown, Fla.; J. E. Parker, Chicago; Erdix Rounds, Owensboro, Ky.; Wallace Stebbins & Sons, Baltimore.

A government pamphlet of some forty pages (document No. 80, fifty-sixth congress) containing the report of Col. G. J. Lydecker, United States engineer at Detroit, relative to delays due to accidents to vessels in the St. Mary's river during last season, has just been issued by the war department. This report was dealt with quite fully in the Review of several weeks ago.

Considerable difficulty has been encountered in the construction of a large dry dock at the West Bay City (Mich.) works of Capt. James Davidson, on account of the caving in of banks.

NOTES FROM THE NAVY REGISTER.

Washington, D. C., Feb. 14.—The first copies of the annual naval register bearing date of Jan. 1, 1900, have just been issued by the navy department. In the last calendar year the casualties among officers in the naval service numbered 161. Forty-four naval officers, including thirty-five naval cadets, resigned. No marine corps officers resigned. The retirements were sixty-three, an unusually large number. Only one, H. L. Howison, had reached the grade of rear admiral when he went on the retired list. Four officers of the marine corps retired and one naval officer was wholly retired—that is dropped from the naval list. Three rear admirals, two of them on the retired list, and forty other officers died during 1899. Two officers died on board ships at sea and one other officer died on his ship while it was anchored at Manila bay. Three officers were killed in action—Lieutenants Philip V. Monaghan and Lansdale, and Ensign John R. Monaghan, and one naval cadet, Welborn C. Wood, the first two in Samoa and the last named in the Philippines.

In the Spanish war only two officers, Ensign Worth Bagley and Assistant Surgeon Gibbs, were killed in action. Three officers died aboard. Of the forty-three officers who died during the year, twenty-four had been retired. The marine corps deaths numbered three. A warrant officer and a naval cadet were dismissed and the rating of one warrant officer revoked.

The retired list presents the peculiar feature of having three medical officers and six pay officers credited with the rank of rear admirals. This condition has resulted from the operation of the new personnel act, which permits officers to retire with the rank and three-fourths sea pay of the next higher grade if they served in the civil war with creditable records. With the exception of the paymaster general and the surgeon general the highest active grade in these corps is relatively that of captain. The retired list is led by the name of Rear Admiral Thomas O. Selfridge, Sr., who was retired for age on April 24, 1866. He is now nearly ninety-four years old. No. 25 on the list of retired rear admirals is Thomas O. Selfridge, Jr., a son of the first named, who passed from active service on account of age on Feb. 6, 1898. He is nearly sixty-three years old.

Admiral Dewey heads the list of live officers. The senior rear admiral is Frederick McNair, superintendent of the naval academy. The junior officer of the service is Ensign Ernest C. Keenan of the Petrel.

FIGURING FOR MORE NEW SHIPS.

Ship builders of the great lakes have been figuring for two weeks past on several important contracts for new vessels, none of them to come out, of course, until the spring of 1901, but it can not be learned that anything has been actually closed. Probably the most important order under consideration is one for three package freight steamers for the Lehigh Valley Transportation Co. of Buffalo. It is thought this order will go to the Union Dry Dock Co. of Buffalo, and if so, that works, even with further improvements that are talked of, would be filled up for eighteen months or more. John L. Crosthwaite of Buffalo, who has two steel steamers building for Atlantic coast service, one at the Craig works, Toledo, and the other at the Union works, Buffalo, has negotiations under way for four more steamers of the same type. Orders for all four of these vessels would probably be placed with lake builders at once, but for the great length of time required for delivery.

The Atlantic Coast Steamship Co., which Mr. Crosthwaite represents in these ship building operations, is an extension of the affairs of the Export Lumber Co. of Bay Mills, Mich., to the coast. Lewis A. Hall is president of the Export company and also of the Atlantic Coast Lumber Co., which has large yellow pine interests in South Carolina. He lives in New York. Wallace Flint, also an officer of the company, is of the New York firm of Flint, Eddy & Co.; Charles R. Flint is of New York rubber fame, and E. B. Freeman, another director, is a capitalist of Georgetown, S. C. The company has extensive docks at Georgetown and is building a rail line to the interior of South Carolina, where it will connect with the leading roads and will easily reach its timber tracts. The steamer line will carry lumber from Georgetown to the northern seaboard cities as far as Boston, the principal office being in New York.

IN BATH SHIP YARDS.

A double launching occurred Saturday, Feb. 10, from the yard of the Bath Iron Works, Bath, Me. At 9 a. m. transfer tug No. 13 of the N. Y., N. H. & H. R. R. was successfully launched and half an hour later tug No. 14 followed from the same ways. These vessels are ideal steel transfer harbor tugs, 140 feet long over all, 26 feet beam and 16 feet deep. Immediately after launching the boilers and engine room auxiliaries were placed on board the vessels. This is the third double launching that has taken place from the yard of the Bath Iron Works and it is the third time that this company has built two vessels on the same ways at the same time.

The six-masted schooner to be built by Percy & Small, Bath, Me., will probably be the largest wooden sailing vessel afloat. She is the same length as, and a little wider than America's largest wood sailing ship, the mammoth Roanoke of the Sewall fleet. Work has already been started on the vessel and she will be completed this fall.

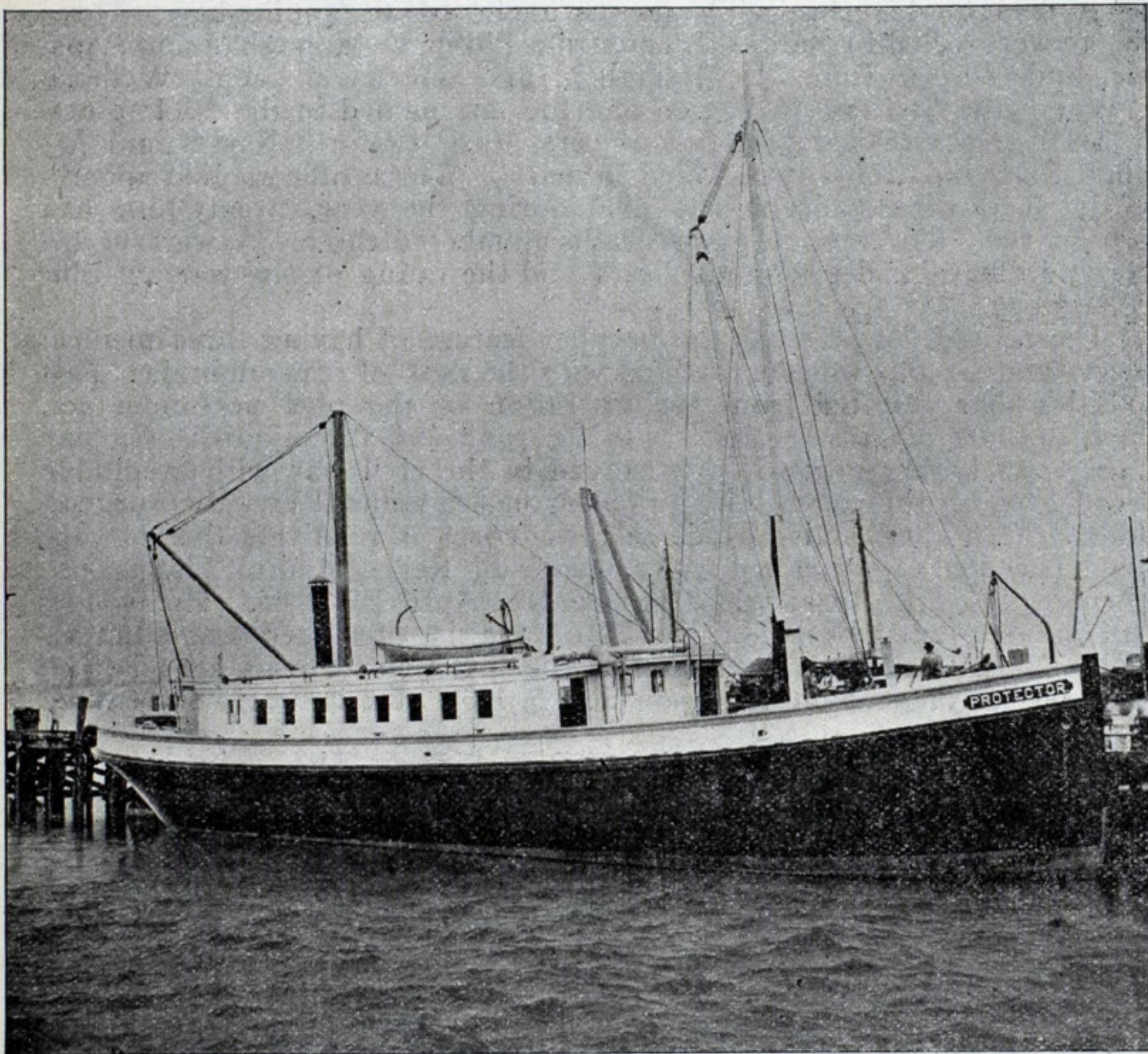
H. L. Holmes of Mystic, who has been negotiating with Boston capitalists for some time regarding the establishment of a ship yard at Mystic, has finally brought matters to a satisfactory climax and work upon the proposed plant will be begun at once.

DISINFECTING SHIPS.

THEIR DEVELOPMENT IN UNITED STATES GOVERNMENT SERVICE—DESCRIPTION OF THE SANATOR, A MODERN VESSEL OF THIS KIND—A WORK LITTLE KNOWN TO THE GENERAL PUBLIC.

BY C. M. GREEN, FIRST ASSISTANT ENGINEER, R. C. S., SUPERINTENDENT OF CONSTRUCTION

The control of new possessions and dependencies by the United States has made it necessary for the United States marine hospital service to greatly increase its appliances for preventing the spread of infectious diseases by disinfection of vessels, together with crew, passengers and baggage at all important ports, and especially Southern ports. Such appliances have been gradually improving for some years, the energies of this bureau being constantly directed to that end and the extended experience of the officers of the service making great advancement possible. The successful and rapid disinfection of the returning troops and troopships at Montauk point in the fall of 1898 by means of the disinfecting barge Protector—just then completed—fully demonstrated the



DISINFECTING SHIP PROTECTOR, U. S. MARINE HOSPITAL SERVICE.

efficiency of a floating disinfecting plant capable of being moved from port to port and of rapidly and easily disinfecting large ships with their passengers or troops and effects. Had no such apparatus been available at that time the spread of disease from the troops returning from Cuba might have been very disastrous, and, although the use of the disinfecting barge was but little known to the general public, the completion and use on that occasion may almost be compared in fortunate results to the timely arrival and use of the Monitor in Hampton Roads during the civil war. This same vessel, the Protector, was of equal service in Havana harbor during the summer and fall, and has attracted the attention of foreign governments, the builders being in receipt of a number of requests therefrom for the plans and specifications.

The bureau is now fitting out for service another disinfecting vessel, the Sanator, just completed by the Kensington Engine Works at Philadelphia. The Sanator was designed and constructed under the supervision of Dr. Walter Wyman, surgeon general of the marine hospital service, and is provided with the latest and most improved Kinyoun-Francis disinfecting and fumigating machinery, the whole plant being a decided improvement on the barge Protector and undoubtedly the most complete disinfecting vessel in the world. The contract price for the vessel was \$56,700, the date of contract being Jan. 3, 1899. Many improvements were afterwards made on the original design, causing changes, which, together with the supplies and outfit, made the total cost of the vessel \$70,243.32.

GENERAL DESCRIPTION OF THE VESSEL.

The Sanator is a low powered steam vessel, capable of making a maximum speed of about 8 knots, this being sufficient to enable her to reach her station and to move around the harbor as may be required. The hull is framed of Delaware oak, planked inside and out with yellow pine and decked with Oregon pine. The use of wood for the construction of the hull was necessitated by the fact that a steel hull is quickly corroded and eaten away by the solution of bichloride of mercury, which is one of the disinfectants used in considerable quantities on the vessel and which cannot be kept out of the bilge. The construction of the hull is very strong and well suited for the purpose intended. The principal dimensions are: Length over all, 161½ feet; beam, extreme of water line, 32 feet; depth top of main deck beams at side to top of keel 13 feet 3 inches; normal draught, mean, 7 feet 9 inches. Bilge keels, 8 by 10 inches, extending for a distance of 80 feet amidships are provided to reduce rolling in a sea way, and the hull is coppered to a mean draught of 8 feet 6 inches. The hold is entirely floored over 12 inches above the keelson, giving a large space for the reception of disinfecting and auxil-

iary machinery. At each end are raised platform decks to increase the floor space.

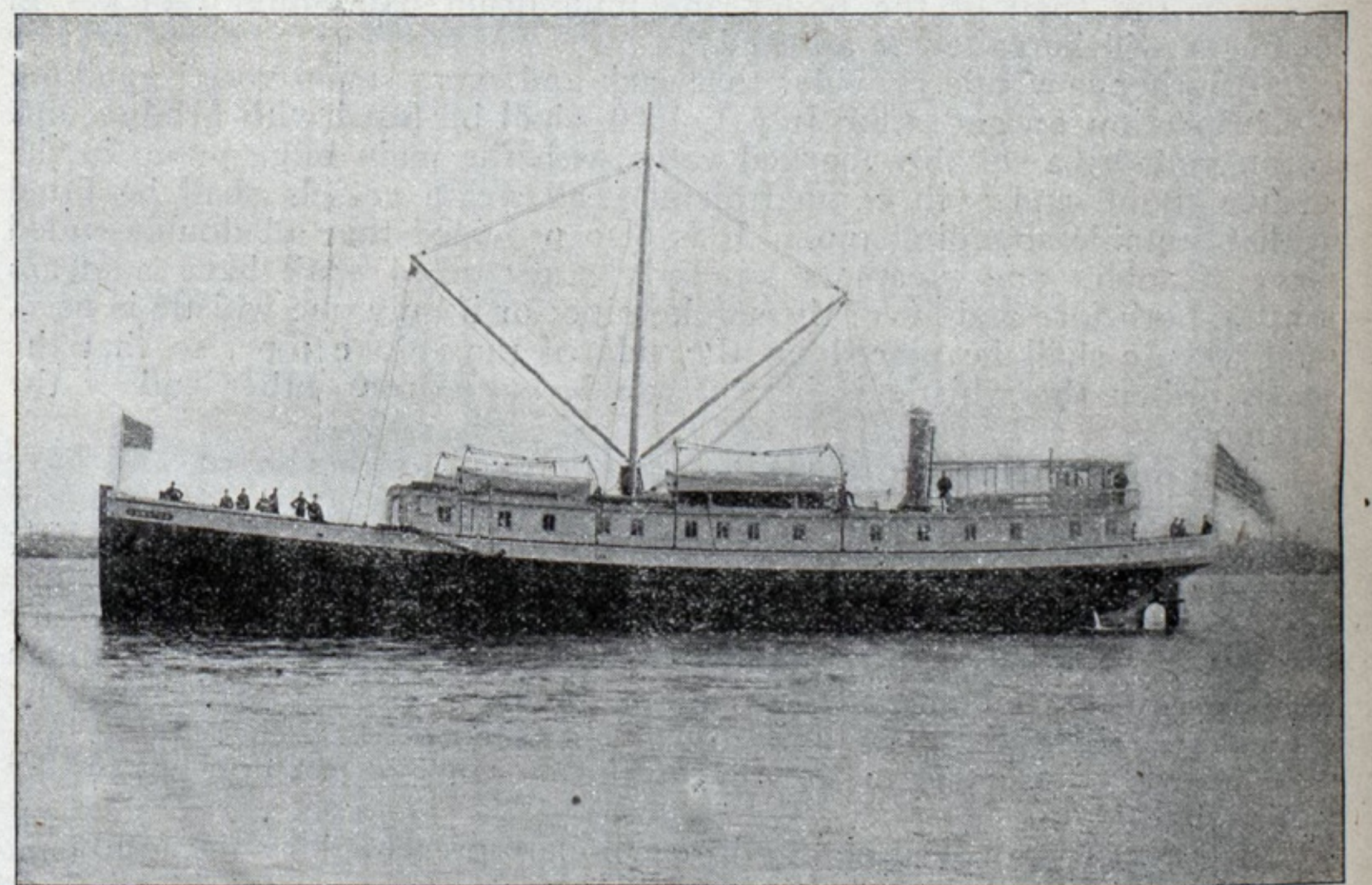
There are two cross bulkheads forming between them the infected compartment of the hold into which is taken all baggage, clothing and effects to be disinfected. This compartment contains the forward ends of the two steam disinfecting chambers with the doors, cars and tracks and also a vat for bichloride of mercury for disinfecting certain articles by immersion in this solution. Above this compartment is a hatch 8 feet square from the main deck and also clothes hatches from the two disrobing rooms in the deck house. This compartment is provided with lockers and racks, but is so built as to be easily disinfected or fumigated as may be necessary after infected goods are handled. Forward of the infected compartment is another compartment, also provided with large hatches. This space contains the chain lockers, paint locker, sulphur bins, two large sulphur furnaces with smoke pipes, sulphur pipes, exhausters and engine, two store rooms and two large fresh water tanks, the latter being located under the raised flooring.

The space aft of the infected compartment is the largest compartment in the vessel. In its forward end are the two steam disinfecting chambers with the formaldehyde gas and ammonia generators, the steam exhausters, cars, tracks, doors and attachments. Goods after being disinfected in the chambers are brought through this compartment and taken up through the after hatch, which is 8 feet square. At the sides abreast of the steam chambers are two fresh water tanks. Aft of these are two storage batteries for lighting purposes. This storage battery system is believed to be the first ever installed in a vessel for the United States government. Aft these are the ventilating blower and engine on the starboard side and the dynamo room on the port side. This latter room contains beside the engine and dynamo the switchboard and connections and a tool locker. Next to the dynamo room is another large water tank, near which is located the steam fire pump. On the starboard side is an 1,800-gallon tank for bichloride of mercury solution and near it a special steam pump connected to force the solution through pipes and hose connections to all parts of the vessel or to a vessel alongside as may be necessary.

Next to these tanks and outboard of the after hatch are the two single ended Scotch boilers and outboard of these are two more water tanks. Next to these are the two coal bunkers holding together 30 tons of coal. Between the coal bunkers is the main engine with its attachments and the main feed pump, the water service pump, the condenser, air and circulating pumps and feed tank. On the raised platform aft are the pressure supply tank, oil tanks, lockers, work bench and a large ice box and refrigerator. On the main deck forward is a steam windlass for handling the anchors and also arranged for working the two derrick booms. Aft there is a hand deck pump arranged for use as a bilge or fire pump. A side ladder which can be shipped on either side of the vessel is provided and also a sea ladder.

DECK HOUSE—EQUIPMENT OF BOATS.

The deck house, 24 feet 6 inches wide, extends for a distance of 99 feet and has an extension at the after end 7 feet 2 inches long on which is located the pilot house. It is divided into two parts, the quarters aft and the rooms for handling infected persons forward. A fore-and-aft



DISINFECTING SHIP SANATOR, U. S. MARINE HOSPITAL SERVICE

bulkhead separates the forward part into two divisions, which may be used for males and females as required. Infected persons are brought on board by the side ladder near the forward end of the deck house. They enter the forward or disrobing rooms, there being one on each side. Their clothing is lowered through the clothes hatches to the infected compartment of the hold where it is sorted and disinfected, going through the steam chambers and up the after hatch. The persons being treated meanwhile pass from the disrobing rooms to the bath rooms—four rooms each with a tub and shower. After bathing they go to the dressing rooms, where their clothing has been delivered after disinfection. They then pass to the waiting rooms, where they remain until taken ashore or to their vessel.

The after part of the upper deck is provided with awning and benches and can be used by waiting passengers in good weather, there being a stairway connecting it with the waiting rooms below. The quarters for officers and crew in the after end of the deck house comprise a mess room, nine staterooms, with two berths each, a galley, storage closets and lockers. There are two water closets in the after end of the house and two connected with the dressing rooms. Besides the eighteen berths

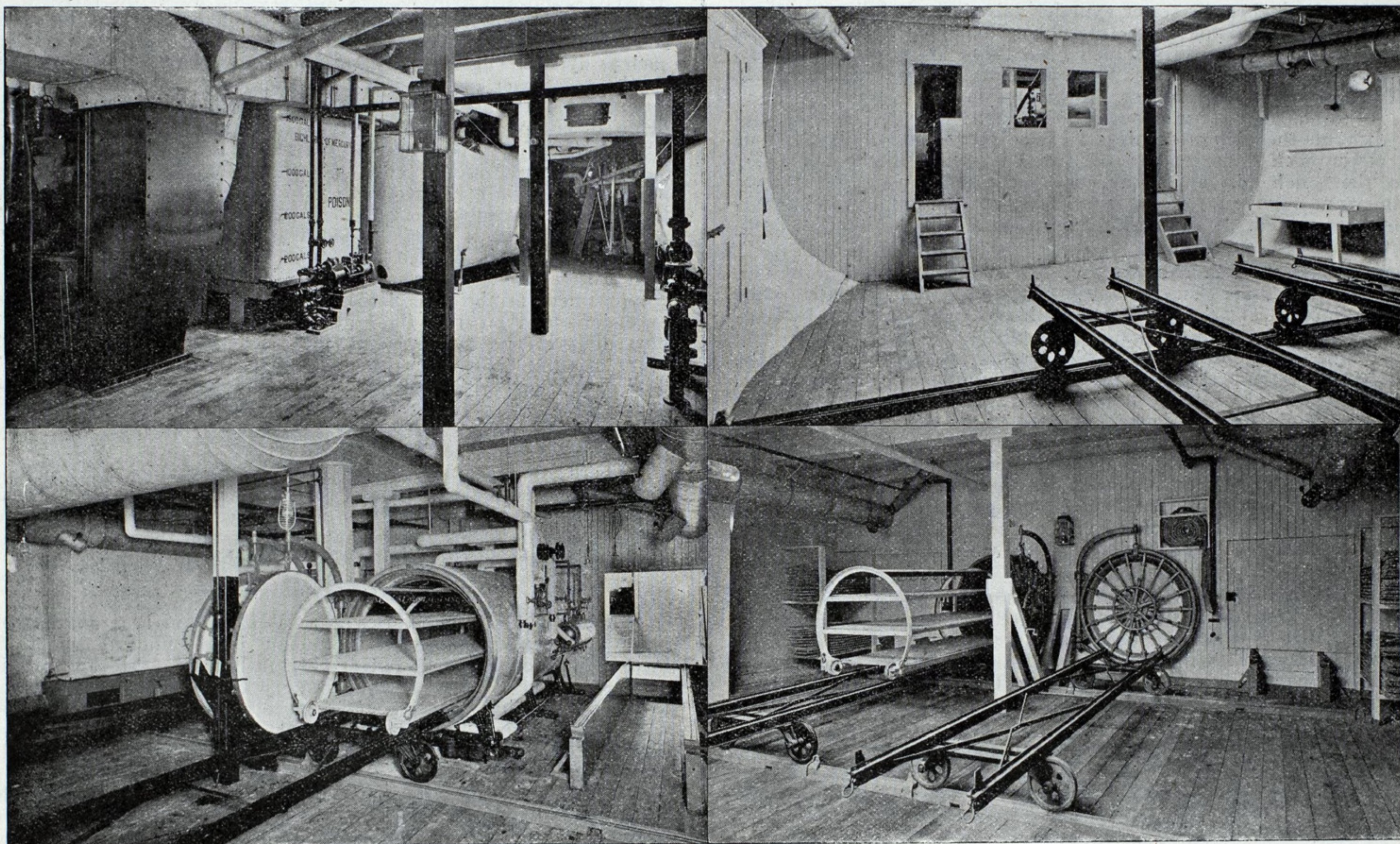
in the staterooms thirty-eight berths are provided in the forward rooms of the deck house. These can be taken down and stowed under the transom seats in those rooms when not required. These berths are for use when passengers are to be detained over night. Two of the staterooms can also be used for this purpose or for temporary hospital purposes.

The pilot house is placed on the extreme after end of the deck house, in order to leave ample working space for the two derricks and the sulphur pipes and hose on the upper deck. The pilot house is provided with the usual hand steering gear, signaling apparatus, voice tubes, etc. A single derrick mast, 63 feet 3 inches high above the main deck, is located midway between the two main hatches, and two booms, each 40 feet long, one for each hatch, are provided for handling baggage. These derrick booms are worked by the steam windlass and are designed to lift 1,500 pounds each. The mast is also provided with the necessary rigging for enough sail to keep the vessel out of the trough of the sea in case the machinery should become disabled while going from port to port. The sails and rigging are removed when the vessel is operating in port. On the upper deck, in addition to the gear for the derricks, are the sulphur mines, sulphur hose locker and the boats with their cradles, davits and attachments and also three skylights for lighting the rooms below.

The boats carried are one 25-foot alco-vapor launch and two 18-foot dinghies. The launch is provided with a 5-horse-power alco-vapor engine and is very completely fitted out with all the necessary attachments, awning, cork cushions, lines and anchor. The 18-foot boats are provided with the usual outfit and also with masts and sails. The launch is car-

steam traps to two 295-gallon drainage tanks under the hold floor, these tanks being emptied overboard by a No. 4 Hayden & Derby steam ejector. Steam and vacuum gauges, safety valves and thermometers are provided and two Watson & McDaniel 1½-inch spring reducing valves are fitted in the steam supply pipes to regulate the pressure. The steam inlet to the interior of the chamber is at the top, and a copper hood extending the whole length of the chamber is provided to prevent steam impinging directly on the goods being disinfected.

Through each chamber near the bottom runs a double track of angle-iron with movable extensions to transfer tables at both ends. Along these tracks can be moved cars of light wrought iron construction containing the goods to be disinfected. These cars are provided with removable galvanized wire trays, brass hooks and galvanized wire folding baskets, either of which may be used, depending on the character of the goods being treated. They are loaded with infected goods or clothing while on the transfer tables in the infected compartment and then pushed into the steam chamber where the disinfection is accomplished. The after doors of the chambers are then opened and the cars brought out on the after transfer tables, where they are unloaded, the disinfected materials being taken up the after hatch. The cars are then moved outboard on the transfer tables and taken forward along raised tracks at the sides of the chambers and through doors in the bulkhead into the infected compartment, where they are again loaded with goods to be disinfected. The length of time of the operation depends upon various conditions, but usually occupies about thirty minutes for each chamber. Steam is kept in the jackets of the chambers during the operation, so that the



U. S. DISINFECTING STEAMER SANATOR—VIEWS OF POISON BATHS, STEAM DISINFECTING CHAMBER AND APPARATUS FOR HANDLING MATERIAL TO BE DISINFECTED.

ried in a cradle on the port side of the upper deck amidships and the two small boats on the same deck forward, davits and rigging being provided for each boat.

DISINFECTING MACHINERY.

Steam chambers—These are two in number and are located side by side with their forward ends projecting through the bulkhead into the infected compartment of the hold. In shape they are cylindrical, being 60¾ inches in diameter outside and 16 feet long. Each is constructed with an inner and outer steel shell 1¾ inches apart, forming a steam jacket, the ends being riveted to heavy cast iron rings and the shells stayed with screw stays. The inner diameter in the clear is 55 inches. At each end is a heavily constructed quick-opening door formed of a dished and flanged steel plate ½ inch thick. The flange of the door bears against a square rubber gasket fitted in a groove in the cast iron end ring. The door is held shut by heavy steel radial arms bearing against an internal groove in the end ring and against blocks near the outer flange of the door, the inner ends of the arms being held in by a large nut and hand wheel working on a stud at the center of the door. An arrangement is provided for quickly withdrawing the radial arms from the groove in the end ring, thus permitting the door to swing open on a special davit and arm provided for the purpose. Ball bearings are provided in all parts, and although the door is heavy and designed to sustain a total pressure of about 38,781 pounds, it can be opened or closed in less than one minute.

The chambers are built to carry a working pressure of 10 pounds per square inch. They are covered with magnesia covering and are fitted with a complete system of steam and exhaust pipes, drains and traps. A No. 6 Korting steam exhaustor is connected with both chambers, which is capable of producing in either a vacuum of 15 inches in a very short time. The drainage is led through two No. 1 Watson & McDaniel

materials disinfected are thoroughly dried before being taken from the chamber. Four cars and four transfer tables are provided as well as forty-eight wire baskets.

Formaldehyde apparatus—Attached to brackets on the side of the starboard steam chamber is an apparatus for generating formaldehyde gas and ammonia gas. It is composed of two generators, one for each gas, secured in one cylindrical casing for compactness and convenience. Each generator consists of a horizontal closed cylinder containing a steam coil and provided with fillers, pressure gauges, safety valves and proper gas pipe connections. The cylinder and pipes for formaldehyde gas are made of brass and copper, those for ammonia of cast steel and iron. Each is connected with both steam chambers, the purpose being to use formaldehyde gas for a disinfectant in either chamber when disinfecting materials which would be injured by steam. The ammonia gas is used after the treatment by formaldehyde gas in order to neutralize the latter and prevent irritating effects on the mucous membrane from inhalation and contact with the goods treated. Either gas is generated by introducing into the generator the proper quantity (computing from the volume of the steam chamber) of formalin or a strong ammoniacal solution, as the case may be, and applying heat by means of the steam coil. Before using either steam or formaldehyde gas in the steam chambers, the air is removed by an exhaustor and a vacuum of about 15 inches formed.

SULPHUR FURNACES—BATH AND WATER SUPPLY APPARATUS.

In the forward hold compartment are the two sulphur furnaces, side by side athwartship. Each is built of steel with cast iron fronts, the dimensions being, length 10 feet, width 3 feet, height to top of reservoir 6 feet 6 inches. There is a fire box at each end of the furnace, over these being shallow cast iron pans for the reception of the sulphur. Dampers and baffle plates are provided to regulate the supply of air and pre-

vent too rapid combustion. On the top is a reservoir where the sulphur dioxide is collected. The smoke from the fire boxes is taken by a pipe near the bottom to a smoke stack leading up through the main deck forward.

Pipes from the gas reservoirs connect to a high speed Sturtevant No. 5 Monogram exhaustor, belted to a vertical engine, having 5 inches diameter of cylinder and 6 inches stroke, and fitted with a governor. This exhaustor delivers the sulphur gas through a 12-inch galvanized iron pipe leading through the main deck to branch pipes extending fore and aft on both sides of the upper deck. On each of these branch pipes are three connections for special 6-inch sulphur hose, by means of which the sulphur gas can be taken into any compartment of a vessel alongside to be fumigated. Five 20-foot sections of the 6-inch hose are provided, these being stowed in a hose locker on the upper deck. The sulphur furnaces and sulphur piping below the main deck are well covered with magnesia covering and the piping on deck is kept well clear of wood work. The sulphur bins forward of the furnaces hold together 40 barrels of sulphur.

An 1,800-gallon steel tank for the storing of bichloride of mercury solution is located in the hold amidships on the starboard side. Above this in the deck house is a forty-gallon mixing tank with connections for steam and water as well as a connection to the large tank below. The proper quantity of the chemical is mixed in the small tank and allowed to flow into the large tank, into which has already been pumped a quantity of water sufficient to make the required solution. Near the large tank in the hold is a special Worthington horizontal duplex pump, having steam and water cylinders of $4\frac{1}{2}$ and $2\frac{3}{4}$ inches diameter respectively and a stroke of 4 inches, its water cylinder valve guard and connections being made of iron and the valves of rubber, it having been found that the bichloride solution acts less quickly on these materials than brass. This pump has suction connections to the sea, the bilge and chloride tank, and delivers to the same tank, to the bichloride pipe system or overboard. Its principal purpose is to take the solution from the tank and force it through the bichloride pipes to hose plugs located on the four corners of the deck house and to the two hose plugs in the hold. By means of the 2-inch hose and spray nozzles the solution can be sprayed as a disinfectant in any part of the vessel or in any part of a vessel alongside being disinfected. A bichloride vat is located in the infected compartment into which articles may be dipped for disinfection.

There are ten 10-inch showers and four porcelain lined iron bath tubs (4 feet 2 inches by 24 inches inside) located in the ten bath rooms in the deck house. These are supplied with water through No. 7 "Gegenstron" water heaters, the latter being supplied with thermometers and steam and water regulating valves. The heaters are located outside the bathrooms and the temperature of the water is regulated by an attendant. The water supply is provided by connections to a pressure tank (diameter 20 inches and height 5 feet 6 inches) located on the after hold platform. A Worthington horizontal duplex pump (size 3 by 2 by 3 inches) provided with an automatic regulating valve supplies this pressure tank with fresh or salt water as may be required. The pump is so arranged as to maintain a constant pressure in the tank automatically. By means of a system of galvanized iron pipes this tank also supplies the nine wash basins in the staterooms and also the galley with fresh water.

The bath rooms and tubs are all provided with drains leading overboard, there being a 3-inch drain on each side for this purpose. The wash basins in staterooms and galley sink are also provided with overboard drains. The four water closet flushing tanks, each holding thirty gallons, are supplied with salt water from the fire system and can be filled by either the deck or steam fire pump. The water closet discharge pipes are of $\frac{1}{4}$ -inch lead and discharge overboard just above the water line.

The vessel is to be provided with four Kinyoun-Francis autoclaves. These are portable formaldehyde gas generators and can be taken into the cabins or rooms of a vessel alongside for disinfecting purposes, the rooms being tightly closed to prevent the escape of the gas.

BOILERS AND ENGINES.

There are two single-ended Scotch boilers located in the hold outboard of the after hatch. The shell of each boiler is made up of two steel plates with longitudinal lap joints double riveted. Each has one cylindrical furnace stiffened by heavy rings and socket rivets. The combustion chambers and the heads are single riveted. The combustion chambers are stayed to shell and back heads by socket rivets. The usual man and hand holes, dry pipe, internal feed pipes, and blow pipes are provided. Each boiler is provided with 80 pounds of rolled zinc suspended from the longitudinal stay rods in iron baskets and making metallic contact with the stays. The tubes are of charcoal iron. A 3-inch Lynde spring safety valve, the usual gauge and gauge cocks and a salinometer pot is attached to each boiler. The uptakes are provided with two dampers for cutting out either boiler. The smoke pipe is 32 inches in diameter and extends 30 feet above the grates. It is provided with a casing $40\frac{1}{2}$ inches in diameter where it passes through the house. A steam jet is connected at the base of the smoke pipe and an exhaust nozzle is also provided, so that in case the engine is used non-condensing the exhaust can be made to assist the draft. The boilers are covered with magnesia covering. Other principal features of the boilers are: Working pressure, 110 pounds; length, outside, 10 feet 3 inches; diameter, outside, 6 feet 10 inches; heating surface, both boilers, 1189.18 square feet; grate surface, both boilers, 42.25 square feet. The feed pump is located on the starboard side of the engine room and is piped to deliver to both boilers through the $1\frac{1}{2}$ -inch feed check valves. It is a Worthington horizontal duplex pump having 6-inch steam cylinders, $2\frac{1}{4}$ -inch water cylinders and 6-inch stroke. Its suction is connected to the fresh water tanks, the feed tank, the sea and the bilge, and it can deliver to either boiler or overboard. Two No. 6 Korting injectors are provided. Either injector can be delivered to either boiler. The suction of one is connected to the feed tank and fresh water tanks, that of the other to the sea and fresh water tanks.

The main engine is of the vertical inverted, direct acting, condensing type with independent pumps. It is of 17 inches cylinder diameter and

20 inches stroke, designed to develop 200 indicated horse power at about 130 revolutions. It is provided with a single-ported flat slide valve, "Myer" cut off gear and all the usual attachments, including relief valves, sight feed oiling gear and revolution counter. The main steam pipe is provided with a large steam separator draining to the feed tank. The engine cylinder is supported by two cast-iron columns, the guides being bolted to the columns and to the cross-head, being of the "T" type with double cross head pins. The bed plate is well stiffened and the thrust bearing bolts directly to it. The thrust bearing is of the horse shoe type, there being three collars forged on the thrust shaft. The main exhaust pipe is covered with branches, gate valves and a transfer valve, so arranged that the exhaust can be led to the condenser, or, if it is desired to use the engine non-condensing, it can exhaust to the atmosphere through the escape pipe or through a nozzle at the base of the stack. The shafting is of solid forged steel, with couplings and thrust collars forged on. The crank shaft is built up and its extension forms the thrust shaft. A spring bearing is provided for the intermediate shaft. The propeller shaft has composition sleeves shrunk on in the two stern tube bearings, the intervening part being provided with a watertight covering. The stern tube is lined with lead and the stern bearing is composed of a brass sleeve with lignum vitae staves. This bearing is fitted in a heavy casting bolted to the stern post. The engine is located as far aft as possible and takes up very little hold space. The propeller is of cast iron of the Trout pattern. It is a true screw, four blades, and of 6 feet diameter and 7 feet 4 inches pitch.

There is a combined condenser, air and circulating pump of the Wheeler admiralty type located athwartship, aft of the engine. The exhaust of the main engine is led to the condenser and it also connects to the auxiliary exhaust pipe so that the auxiliary machinery of the vessel, such as dynamo engine, ventilating-blower engine, etc., can exhaust either to the condenser or through the escape pipe. The condenser and its pumps are of the usual construction for marine work, the condenser tubes being of composition, tinned, and the pumps being composition lined. The length of condenser over all is 7 feet 11 inches, and the diameter outside of flanges 29 inches; cooling surface, 465 square feet. The circulating pump suction is connected to a 5-inch composition sea valve and also to a 5-inch bilge injection valve. A suction air pump is also provided.

The feed tank is of steel 4 feet 6 inches long, 18 inches wide and 30 inches high. It is divided into three watertight compartments by vertical plates. The feed water is delivered by the air pump into the end compartment at the top, passes down through the filtering material—excelsior—is taken from the bottom by a pipe leading to the top of the next division and there the process is repeated, thus freeing the feed water of oil received from the engine and auxiliary machinery. The feed tank is provided with overflow and drain pipes, watertight covers, water gauge glass, rolled zinc, etc., and is connected to the feed pump and injector suction pipe. The overflow pipe is so arranged that any water passing down it can readily be seen.

There are seven large steel fresh water tanks not including the bichloride of mercury tanks and the various smaller tanks. These seven tanks hold in all 10,000 gallons of fresh water. Each is provided with manholes, baffle plates, water gauge glasses, and the usual vents and pipe connections, the suction piping being 3 inches in diameter.

AUXILIARY MACHINERY.

Included in the auxiliaries is a Worthington horizontal duplex fire pump. A Sturtevant electric light plant is of sufficient capacity to care for one hundred 16-candle-power 110-volt lights. A storage battery, constructed by the Electric Storage Battery Co. of Philadelphia, consists of sixty cells and has capacity sufficient to carry fifty 16-candle-power 110-volt lights for ten hours after being charged. A Sturtevant blower with high speed engine provides ventilation. The fan is 75 inches in diameter and its width is 26 inches. The ventilating plant is designed to entirely renew the air in all parts of the hold every five minutes, the designed capacity of the blower being 12,000 cubic feet of air per minute when it is making about 260 revolutions per minute. A combined steam windlass and hoisting winch is of American Ship Windlass manufacture. There are two Baldt stockless anchors, one weighing 1,236 pounds and the other 815 pounds. A Gould double-brake hand deck pump of the "Challenge" pattern and No. 5 Hayden & Derby steam bilge ejector are also included among the auxiliaries.

TO COMMISSION THE KEARSARGE.

Washington, D. C., Feb. 14.—The committee appointed by Governor Rollins of New Hampshire for procuring some suitable memorial to be presented to the battleship Kearsarge has formed a program of elaborate proportions. The committee has in contemplation not only the presentation of a memorial to the Kearsarge but a like memorial to the Alabama, the companion battleship of the Kearsarge, and in this way to efface whatever ill-feeling exists between the two states as the result of the fight at sea between the Kearsarge and Alabama in 1864. The memorials to be given the two battleships will be a bronze figure of the Indian Chief Kearsarge and will be designed to become a permanent fixture of each warship. On the occasion of the presentation it is intended to have President McKinley and members of his cabinet, former secretary of the navy Herbert and many distinguished Americans in attendance.

Although it is reported from the works of the Newport News company that it will probably be impossible to have the Kearsarge ready to go into commission on the 20th inst., that date has been fixed by the navy department. Capt. William M. Folger will assume command of the vessel at the Norfolk navy yard. Other officers ordered for duty on the vessel are: Lieutenant Commander G. A. Merriam, executive; Lieutenant Commander N. R. Usher, navigating officer; Lieutenant J. M. Poyer, Lieutenant R. T. Tisdale, now at the navy yard, Washington; Lieutenant H. W. Harrison, now in the naval intelligence office; Lieutenant Emil Theiss, Surgeon H. E. Ames, Lieutenant C. W. Jungen, now at the branch hydrographic office, New York; Acting Gunners C. S. Vanderbeck and J. H. Lohwar; Carpenter T. W. Richards, Warrant Machinists Otto Johnson and Martin Casey.

MASTERS AND ENGINEERS.

APPOINTMENTS OF OFFICERS FOR SHIPS OF THE GREAT LAKES,
SEASON OF 1900.

Cleveland-Cliffs Iron Co., Cleveland, J. H. Sheadle, manager for this and other companies that follow: Cleveland-Cliffs Co.: Steamers—Pontiac, Capt. S. A. Lyons, Engineer T. B. Kelley; Frontenac, Capt. Geo. A. Symes, Engineer T. J. Rees; Cadillac, Capt. H. H. Parsons, Engineer J. B. Hart; Andaste, Capt. C. E. Sayre, Engineer E. A. Carter; Choctaw, Capt. J. M. Johnston, Engineer Thos. Blaine; Pioneer, Capt. A. W. Stalker, Engineer Thos. Durkins. Schooner—Chattanooga, Capt. A. C. Reimers. Hopkins Steamship Co.: Steamer—Centurion, Capt. David Hutcheson, Engineer Thos. Welsh. Presque Isle Transportation Co.: Steamers—Presque Isle, Capt. Jas. B. Lowe, Engineer E. I. Jenkins; Angeline, Capt. S. N. Murphy, Engineer E. V. Barry. St. Clair Steamship Co.: Steamer—Kaliyuga, Capt. G. D. Tulian, Engineer James Bennett. Schooner—Fontana, Capt. G. A. McCoy. Wm. G. Mather, Managing Owner: Steamer—Edw. S. Pease, Capt. T. E. Murray, Engineer John J. Booth. Schooner—Planet, Capt. Frank Parsson.

American Steamship Co., A. B. Wolvin, Mgr., Duluth: Steamers—W. H. Gilbert, Capt. R. J. Cowley, Engineer A. McGillvery; Zenith City, Capt. D. P. Wright, Engineer A. B. Hodge; Queen City, Capt. R. Humble, Engineer A. L. Eggert; Crescent City, Capt. A. R. Robinson, Engineer C. H. Burke; Empire City, Capt. Jas. Leiske, Engineer Frank Mansfield; Superior City, Capt. J. L. Weeks, Engineer Frank Swartz; J. W. Gates, Capt. R. J. Lyons, Engineer Andrew Haas; James J. Hill, Capt. F. P. Houghton, Engineer Wm. Most; Isaac L. Ellwood, Capt. H. L. Mills, Engineer Geo. Lawrence; Wm. Edenborn, Capt. Geo. Bell, Engineer E. S. Stoddard.

Mitchell & Co., Cleveland: Steamers—W. E. Reis, Capt. Chas. B. Galton, Engineer Wm. Fetting; H. C. Frick, Capt. S. S. Stratton, Engineer Peter Lavelly; M. A. Hanna, Capt. M. P. Parsons, Engineer Wm. Fritz; H. S. Holden, Capt. F. D. Galton, Engineer Gus. Guy; Lagonda, Capt. R. C. Jackson, Engineer Irwin Francombe; J. J. McWilliams, Capt. B. D. Townsend, Engineer Frank Parker; John Mitchell, Capt. Alex. Begg, Engineer John Riley; R. L. Fryer, Capt. H. Townsend, Engineer Thos. Ward; Geo. T. Hope, Capt. John Baird, Engineer Louis Minnie. Schooner—Troy, Capt. —.

Calvin Co., Garden Island, Ont.: Steamers—India, Capt. A. H. Malone, Engineer Thos. C. Smith; D. D. Calvin, Capt. Chas. Coons, Engineer Wm. Cunningham; Bothnia, Capt. G. A. Brian, Engineer Robt. Vench; Reginald, Capt. John Doyle, Engineer John Kennedy; Parthia, Capt. D. Lefarve, Engineer G. Sauve; Chieftain, Capt. John Sullivan, Engineer Thos. Gray; Wm. Johnston, Capt. Ed. Phelix, Engineer Thos. Compe; Bluebell, Capt. John Dix, Engineer Chas. LeRiche. Schooners—Ceylon, Capt. Horatio Smith; Augustus, Capt. Jos. Achee; Valencia, Capt. John Ferguson.

Fitzgerald, W. E., Milwaukee: Steamers—J. W. Westcott, Capt. J. D. Wanvig, Engineer Geo. Chipman, Jr.; Omaha, Capt. D. Wilson, Engineer C. Brudschneider; Topeka, Capt. John Tower, Engineer Wm. Grant; Pueblo, Capt. D. Stalker, Engineer Alex. Staley; Denver, Capt. P. Christenson, Engineer John Smith; Hennepin, Capt. A. E. McGregor, Engineer Wm. Bridges; Nebraska, Capt. Peter Thompson, Engineer —; E. M. Peck, Capt. A. C. Callam, Engineer Wm. Brake; Alice Stafford, Capt. C. D. Ross, Engineer H. C. McLean.

Detroit, Belle Isle & Windsor Ferry Co., Detroit: Steamers—Victoria, Capt. John Foster, Engineer Walter Merrill; Excelsior, Capt. Fred Jarvis, Engineer S. G. Merrill; Fortune, Capt. D. Jaques, Engineer Fred Wolff; Garland, Capt. M. McCune, Engineer —; Sappho, Capt. Geo. D. Howe, Engineer Henry Vaughn; Promise, Capt. Robt. Ferguson, Engineer Henry Free; Pleasure, Capt. John Wilkinson, Engineer Nicholas Huff.

Union Transit Co., H. C. French, Mgr., Buffalo: Steamers—J. M. Nicol, Capt. Wm. McLean, Engineer Geo. E. Tretheway; Eber Ward, Capt. John L. McIntosh, Engineer James Countryman; Avon, Capt. Norman McGuire, Engineer Joseph Jamieson; W. H. Stevens, Capt. Alex. Clark, Engineer J. E. McSweeney; Portage, Capt. John Tyrney, Engineer Geo. W. Haig; Jas. Fisk, Jr., Capt. John Pearson, Engineer R. H. Lawson.

Detroit & Cleveland Nav. Co., D. Carter, Mgr., Detroit: Steamers—City of Detroit, Capt. A. J. McKay, Engineer W. S. Huff; City of Cleveland, Capt. Archy McLachlan, Engineer James Middleton; City of Alpena, Capt. M. Lightbody, Engineer A. Phillips; City of Mackinac, Capt. H. J. Slyfield, Engineer Wm. McDonald; City of the Straits, Capt. Duncan McLachlan, Engineer John Sargeant.

North Western Transportation Co., L. C. Waldo, Mgr., Detroit: Steamers—Harvey H. Brown, Capt. David Girardin, Engineer John H. Hand; S. R. Kirby, Capt. John F. Jones, Engineer Wm. Watts; Fayette Brown, Capt. Jos. A. Powell, Engineer Nicklas Anderson. Schooner—Geo. E. Hartnell, Capt. C. L. Allen.

Stevenson, John, Detroit: Steamers—C. H. Starke, Capt. Wm. Crosby, Engineer John Elsey; Miami, Capt. H. Huyser, Engineer John Losey; J. H. Pauly, Capt. Geo. Ferguson, Engineer Milo Roach; Besie, Capt. W. J. Joork, Engineer A. Hamlin; Hattie, Capt. N. L. Stewart, Engineer John Smith.

Mutual Transportation Co., Capt. Geo. P. McKay, Mgr., Cleveland: Steamers—Coralia, Capt. Wm. Cumming, Engineer Chas. J. Love; Coróna, Capt. S. Murphy, Engineer Grant Donaldson; Corsica, Capt. A. J. Greenley, Engineer O. H. Gillmore; Cambria, Capt. J. Laframboise, Engineer E. H. Learned.

Mutual Transit Co., Geo. P. McKay, Mgr., Cleveland: Steamers—Grecian, Capt. P. L. Millen, Engineer Thos. Kelley; Roman, Capt. Richard Jollie, Engineer Sam'l Wells; Saxon, Capt. Martin Johnson, Engineer Geo. E. Averill; Briton, Capt. J. B. Watts, Engineer A. J. Haig; German, Capt. Emil Detlefs, Engineer Fred Warning.

Hutchinson, J. T., Cleveland: Steamers—Germanic, Capt. M. H. Place, Engineer —; Rube Richards, Capt. Harry Savage, Engineer —; Queen of West, Capt. C. J. DeBean, Engineer Geo. Blauvelt.

Schooners—Emma C. Hutchinson, Capt. T. K. Woodward; May Richards, T. S. Emery.

Boland, J. J., Buffalo: Steamer—Garden City, Capt. D. O'Hagen, Engineer —. Schooners—Westford, Capt. J. O'Hagen; Manitowoc, Capt. Hugh O'Hagen; Monitor, Capt. Alex. McLean; Atmosphere, Capt. M. Lynch; J. C. King, Capt. Alfred Nerburn.

Hope Transportation Co., J. A. Francombe, Mgr., Detroit: Steamer—W. R. Stafford, Capt. B. Chamberlain, Engineer Julius Holden. Schooners—Ed. McWilliams, Capt. Geo. Johnson; John A. Francombe, Capt. John Mason.

Rice, W. E., Port Huron, Mich.: Steamer—Rhoda Stewart, Capt. Wm. J. Cowles, Engineer Gil. McLelland. Schooners—Wm. Brake, Capt. Fred Kirker; Golden Rule, Capt. Chas. Recor; Magnet, Capt. Geo. J. Bennett.

Ann Arbor R. R. & S. S. Line, Toledo, O.: Steamers—No. 1, Capt. F. E. Butler, Engineer A. A. Ackerman; No. 2, Capt. H. F. Rydt, Engineer T. J. Harkins; No. 3, Capt. Wm. Nickelsen, Engineer T. H. Cosgrove.

Lehigh Valley Trans. Co., Buffalo: Steamers—Seneca, Capt. Dennis Driscoll; Tuscarora, Capt. Wm. Jones; Saranac, Capt. Parlane McFarland; E. P. Wilbur, Capt. Chas. E. Tuller; Tacoma, Capt. J. A. Whitesides.

Munroe, Thos., Muskegon, Mich.: Steamer—George C. Markham, Capt. Anton Christensen, Engineer Albert Green. Schooners—Lyman M. Davis, Capt. Dehard Nelson; Minerva, Capt. Hans. Hermanson.

St. Lawrence & Chicago Steam Nav. Co., J. H. G. Hagerty, Mgr., Toronto, Ont.: Steamers—Algonquin, Capt. James McMaugh, Engineer James H. Ellis; Rosedale, Capt. James Ewart, Engineer Edward O'Dell.

Parker, G. W., Marine City, Mich.: Steamer—D. F. Rose, Capt. Cass. M. Saph, Engineer —. Schooners—Buckeye State, Boscobel, Marine City, all under direction of captain of steamer.

Merchants Line, G. E. Jacques & Co., Mgrs., Montreal, Can.: Steamers—Cuba, Capt. Henry Chestnut, Engineer Wm. Kennedy; Melbourne, Capt. Arthur Lefebvre, Engineer Thos. Milne.

Slyfield, A. B., Port Huron, Mich.: Steamer—White Star, Capt. A. B. Slyfield, Engineer Henry Woods. Schooners—Eva. S. Robinson, Capt. Geo. L. Slyfield; Annie P. Grover, Capt. —.

McLachlan Trans. Co., Port Huron, Mich.: Steamer—Kittie M. Forbes, Capt. James W. Montgomery, Engineer A. L. Hatch. Schooner—Mary E. McLachlan, Capt. Geo. B. Fuller.

Thomson Line, C. W. Thomson, Mgr., St. Clair, Mich.: Steamer—Pilgrim, Capt. E. Hayward, Engineer R. Robertson; Douglas, Capt. F. J. Meno, Engineer Jos. Meno, Sr.

Lake Ontario & Bay of Quinte Steamboat Co., Kingston, Ont.: Steamers—North King, Capt. John Jarrell, Engineer O. J. Hickey; Hero, Wm. Bloomfield, Engineer Geo. Boyd.

Jenkins, John, Marine City, Mich.: Steamer—W. H. Sawyer, Capt. John Jenkins, Engineer Nelson Gulette. Schooners—A. C. Tuxbury, Capt. J. C. Angell; C. E. Redfern, Capt. —.

Milwaukee Tug Boat Line, Wm. H. Meyer, Managing Owner, Milwaukee: Steamers—Helena, Capt. Wm. E. Wright, Engineer Scott Pratt; Neosho, Capt. O. J. Soleau, Engineer John McCaffrey.

Charlevoix Lumber Co., Charlevoix, Mich.: Steamer—Pine Lake, Capt. Herman Oertling, Jr., Engineer John Charmock. Schooner—Naiad, Capt. Christ. Edwardson.

Warde, John J., 409 Oake St., Chicago: Steamer—Niko, Capt. Thos. Biggs, Engineer Luke Mannion. Schooner—Annie M. Peterson, Capt. Chas. Bough.

Ralph, P. J. & Co., Detroit: Steamer—S. J. Macy, Capt. M. H. Gotham, Engineer W. F. Gregory. Schooner—Mabel Wilson, Capt. J. E. Gotham.

Ohio & Penn. Trans. Co., Cleveland: Steamer—Alcona, Capt. W. T. Sutherland, Engineer —. Schooner—Alta, Capt. John McNamara.

Bielman, C. F., Detroit: Steamer—Mail boat Florence B., Captains Ed. Dunn and Ed. Barker, Engineers Jos. Palmer and Jos. Rousseau.

Buckeye Steamship Co., C. L. Hutchinson, Mgr., Cleveland: Steamer—City of Glasgow, Capt. John McNeff, Engineer C. R. Price.

Haynes, F. J., Port Huron, Mich.: Schooners—Andrew Jackson, Capt. David Gleason; Charlie Crawford, Capt. Allen Curtis.

Stewart Transportation Co., C. F. Bielman, Mgr., Detroit: Steamer—C. F. Bielman, Capt. Fred Stewart, Engineer Robt. Lacey.

Roby Trans. Co., L. C. Waldo, Mgr., Detroit: Steamer—L. C. Waldo, Capt. John W. Duddleson, Engineer T. E. Allen.

Owen, J. Emory, Trans. Co., R. T. Gray, Mgr., Detroit: Steamer—John Owen, Capt. E. F. Thorp, Engineer S. L. Phillips.

Buckley, Edward, Manistee, Mich.: Steamer—Edward Buckley, Capt. Charles Gnewuch, Engineer Richard Winkler.

Kelly Island Lime & Transport Co., Cleveland: Steamer—A. Y. Gowen, Capt. C. Smith, Engineer C. C. Smith.

Fairgrieve & Co., J. B. Hamilton, Ont.: Steamer—Arabian, Capt. Oliver Patenaude, Engineer James Smeaton.

Loutit, W. H., Grand Haven, Mich.: Steamer—Pentland, Capt. Thos. McCambridge, Engineer C. Ball.

Buttironi, Kate, Marine City, Mich.: Steamer—Kate Buttironi, Capt. C. E. Norton, Engineer S. C. Bement.

Dunham, J. S., Chicago: Steamer—City of London, Capt. Wm. Anderson, Engineer J. J. Staley.

Brown, H. H., Cleveland: Steamer—Castalia, Capt. C. C. Allen, Engineer Edward Dempsey.

Adams, Tom, Detroit: Steamer—Tom Adams, Capt. Duncan Nicholson, Engineer James Kelly.

Ashley & Dustin, Detroit: Steamer—Frank E. Kirby, Capt. A. J. Fox, Engineer H. Lewis.

McVittie, Alex., Detroit: Steamer—Senator, Capt. E. B. McQueen, Engineer Andrew Carter.

Miller J. B., Toronto, Can.: Steamer—Seguin, Capt. J. B. Symes, Engineer D. L. Foley.

Central Passenger Association mileage tickets will be accepted on trains of the Nickel Plate road on and after Feb. 10. 18, Mar. 2.

RECORDS OF A GREAT WATERWAY.

INTERESTING DISCUSSION OF ST. MARY'S FALLS CANAL STATISTICS—COST OF MOVING FREIGHT ON THE GREAT LAKES IN 1899.

As a result of the high freights that prevailed on the great lakes during the season of 1899, the records of St. Mary's Falls canal commerce (combined traffic of both Canadian and American canals is referred to all through this summary) show a cost per ton per mile of a fraction more than a mill (1.05) for that year, as against 79 hundredths of a mill in 1898, 83 hundredths in 1897 and 99 hundredths in 1896. Although higher than in previous years, this cost of moving a ton of freight a mile is of course still by great odds the lowest in the world. Immediately following the close of the canal each season, a part of the clerical force takes up, from reports submitted by every vessel passing the canals, the preparation of what is known as the "mile-ton" report. The information as to the tonnage of the vessels and their cargoes is supplemented by reports from commercial organizations, vessel owners and others, regarding prices of different commodities, freight rates, etc. The statistics thus put together are highly interesting.

The total freight traffic of 25,255,810 net tons shows an increase of 4,021,146 tons, or 19 per cent over that for 1898; the total number of passengers was 49,082, an increase of 5,656, or 13 per cent. The open season of navigation covered a period of seven months and twenty-five days, during which time the average monthly freight traffic was 3,224,146 tons.

The American canal passed 22,252,139 freight-tons, being an increase of 4,067,988 net tons over the year 1898, or 22 per cent; the number of passengers was 33,664, an increase of 6,106, or 22 per cent, as compared with 1898. The Canadian canal passed 3,003,671 freight-tons, which was a decrease of 46,842 net tons, or 1½ per cent; the number of passengers was 15,418, a decrease of 450, or 3 per cent, as compared with 1898. Of the total freight the American canal passed 88 per cent and 68.6 per cent of the total number of passengers; the Canadian canal 12 per cent and 31.4 per cent respectively.

The vessel passages through both canals numbered 20,255, as against 17,761 for the year 1898, an increase of 2,494, or 14 per cent; the lockages numbered 10,999, which is 1,466 more than in 1898, or an increase of 15 per cent. The United States canal was opened May 2 and closed Dec. 18, 1899; season, 231 days. The Canadian canal was opened April 26 and closed Dec. 20, 1899; season, 239 days.

COMPARATIVE STATEMENT OF COMMERCE THROUGH CANALS AT SAULT STE. MARIE, SEASONS OF 1898 AND 1899.

Items.	Total Traffic for		Increase, 1899.		Decrease, 1899.	
	Season 1899	Season 1898.	Amount.	Per Ct.	Amount.	Per Ct.
Vessel passages.						
Steamers, number.....	14,378	12,461	1,917	15		
Sails, number.....	4,776	4,449	327	7		
Unregistered, number.....	1,101	851	250	29		
Total vessel passages.....	20,255	17,761	2,494	14		
Lockages, number.....	10,999	9,533	1,466	15		
Registered net tons.....	21,958,347	18,622,754	3,335,593	18		
Freight, net tons.....	25,255,810	21,234,664	4,021,146	19		
Passengers, number.....	49,082	43,426	5,656	13		
Anthracite coal, net tons.....	841,281	540,843	300,438	56		
Bituminous coal, net tons.....	3,099,606	3,235,607			136,001	4
Flour, barrels.....	7,114,147	7,778,043			663,896	9
Wheat, bushels.....	58,397,335	62,339,996			3,942,661	6
Grain, other than wheat, bu.....	30,000,935	26,078,384	3,922,551	15		
Man'd iron, net tons.....	214,585	250,170			35,585	14
Salt, barrels.....	316,336	301,560	14,776	5		
Copper, net tons.....	120,090	124,226			4,136	3
Iron ore, net tons.....	15,328,240	11,706,960	3,621,280	31		
Lumber, M. ft. B. M.....	1,038,057	895,485	142,572	16		
Silver ore, net tons.....	487	0	487			
Building stone, net tons.....	39,063	4,670	34,393	736		
General md'se, net tons.....	587,484	623,146			35,662	6

American vessels carried 96.9 per cent of the total freight and 46 per cent of the total passengers. Canadian vessels carried 3.1 per cent of the total freight and 54 per cent of the total passengers. Other interesting features of the report are as follows: Total mile-tons, 20,891,944,628; total freight carried, net tons, 25,255,810; total valuation placed on freight carried, \$281,364,750; average value per ton of freight carried, \$11.14; total amount paid for freight transportation, \$21,959,707.25; average distance freight was carried, miles, 827.2; cost per mile per ton, mills, 1.05; average cost per ton for freight transportation, 87 cents; time American lock was operated, days, 231; time Canadian lock was operated, days, 239.

ESTIMATED VALUE OF FREIGHT PASSING THROUGH CANALS AT SAULT STE. MARIE, SEASON OF 1899.

ITEMS.	Unit.	Quantity.	Price per unit.	Valuation.
Coal, (Anthracite).....	Net tons	841,281	\$ 5.70	\$ 4,795,302
Coal, (Bituminous).....	Net tons	3,099,606	2.60	8,058,976
Flour.....	Barrels	7,114,147	3.60	25,610,929
Wheat.....	Bushels	58,397,335	.75	43,798,001
Grain (other than wheat).....	Bushels	30,000,935	.59	17,700,552
Manufactured iron.....	Net tons	191,110	100.00	19,111,000
Pig iron.....	Net tons	23,475	19.50	457,762
Salt.....	Barrels	316,336	.75	237,252
Copper.....	Net tons	120,090	320.00	38,428,800
Iron ore.....	Net tons	15,328,240	3.40	52,116,016
Lumber.....	M. Ft. B. M.	1,038,057	17.00	17,646,969
Silver ore.....	Net tons	487	125.00	60,875
Building stone.....	Net tons	39,063	12.00	468,756
General merchandise.....	Net tons	587,484	90.00	52,873,560
Total.....				\$281,364,750

Average value per ton of freight for season of 1899, \$11.14.
Average value per ton of freight for season of 1898, \$10.98.

The relative value of commodities passing through the canals was as follows: Coal, anthracite and bituminous, 4.5 per cent; cereals, wheat, rye, oats, corns, etc., 31 per cent; iron ore, manufactured and pig iron, 25 per cent; copper, 13.7 per cent; lumber, 6.3 per cent; all other articles, 19 per cent.

The maximum traffic for a single day was on August 7, when 207,962 freight-tons were passed by 154 vessels, whose registered tonnage amounted to 156,119. The minimum traffic for a single day was on Dec. 20, when 9 freight tons were passed by five vessels, whose registered tonnage amounted to 148.

TABLE SHOWING TOTAL FREIGHT, ITS VALUATION, COST OF TRANSPORTATION, AVERAGE LENGTH OF TRIPS AND COST PER TON PER MILE FOR SEASONS INDICATED.

Year.	Total freight, net tons.	Valuation of freight.	Total cost of transportation.	Average distance freight was carried.	Cost of transportation per mile-ton.
				Miles.	Mills.
1887.....	5,494,649	\$ 79,031,757	\$10,075,153.13	811.4	2.3
1888.....	6,411,423	82,056,019	7,883,077.40	806.4	1.5
1889.....	7,516,022	83,732,527	8,634,246.63	790.4	1.5
1890.....	9,041,213	102,214,948	9,472,214.90	797.2	1.3
1891.....	8,888,759	128,178,208	9,849,022.81	820.4	1.35
1892.....	11,214,333	135,117,267	12,072,850.88	822.4	1.31
1893.....	10,796,572	145,436,957	9,957,483.11	831.9	1.1
1894.....	13,195,860	143,114,502	10,798,310.28	821.1	.99
1895.....	15,062,580	159,575,129	14,238,758.02	830	1.14
1896.....	16,239,061	195,146,842	13,511,615.80	836.4	.99
1897.....	18,982,755	218,235,927	13,220,099.84	841.3	.83
1898.....	21,234,664	233,069,740	14,125,896.00	842.6	.79
1899.....	25,255,810	281,364,750	21,959,707.25	827.2	1.05

NOTE—Cost of transportation includes loading and unloading charges.

KINDS OF VESSELS USING THE CANALS—THE RECORD BREAKERS.

Among records of the big vessels the following notes are made. Steamer Malietoa, owned by Pickands Mather & Co. of Cleveland, moved 8,215 net tons in a single cargo; steel tow barge John Smeaton, owned by Bessemer Steamship Co., moved 8,339 net tons in a single cargo; steamer Presque Isle, controlled in office of Cleveland-Cliffs Iron Co., Cleveland, moved through the canals during the season, 187,816 net tons; steamer Andrew Carnegie, owned by Wilson Transit Co., Cleveland, covered 42,027 miles during the season; steamer H. W. Oliver, owned by Wilson Transit Co. of Cleveland, had 141,475,588 mile-tons to her credit for the season.

Ten steam vessels of the largest kind had average cargoes throughout the season of 7,385 net tons; eighteen averaged 6,423 tons; nineteen averaged 5,420; thirteen averaged 4,525; 114 averaged 3,404; seventy-four averaged 2,511. Of the tow barges four averaged 8,179 net tons; nine averaged 6,404; thirteen averaged 5,790; nine averaged 4,445; twenty-five averaged 3,552, and thirty-five averaged 2,309.

The report also shows that 344 vessels using the canals are capable of carrying collectively in a single trip 1,308,603 net tons of freight. Forty-one vessels using the canals were of 400 to 500 feet length; 126 of 300 to 400 feet; 267 of 200 to 300 feet; 289 of 100 to 200 feet; 109 of 100 feet and less.

The records show that vessels consumed 20,486 hours and 46 minutes in canal, or an average of 1 hour, 14 minutes and 35 seconds, which includes time waiting for lockage and passage through canal and locks. Other delays at the canal, which included taking on supplies, waiting for daylight or favorable weather, amounted to 17,773 hours and 40 minutes.

The canal postoffice handled 97,378 pieces of mail during the season, consisting of 86,097 letters, 5,039 postals, 5,775 newspapers and 467 parcels. In addition to this, 877 pieces were returned to the city postoffice after being held thirty days uncalled for, and 1,372 pieces were forwarded to new addresses. This shows an increase over the previous year of 16,849 pieces of mail.

From Oswego comes announcement of the death of Rudolphus D. S. Tyler, who will be remembered by some of the older vessel men of the Lake Ontario section. Mr. Tyler and Capt. Geo. L. DeWolf of the United States steamboat inspection service, Cleveland, were relatives. Mr. Tyler had not, however, been connected with shipping for a great number of years. In the civil war he attained the rank of major, and afterward occupied several positions of an important public kind in Oswego. He was postmaster of Oswego for a time and was at the head of the police force for several years. He was appointed superintendent of equipment in the postoffice department by President Cleveland and served in that capacity for ten or twelve years. His service in the postal department was of a very efficient and progressive kind.

Congratulations regarding the special ship building number of last week have been received by the Marine Review from all quarters. One of them, from Mr. Eugene T. Chamberlain, United States commissioner of navigation, is especially gratifying, as Mr. Chamberlain, probably more so than anybody else in the country, understands the labor involved in a work of this kind. "This number," Mr. Chamberlain says, "is certainly one of the finest publications and the most useful that I have seen in many a day."

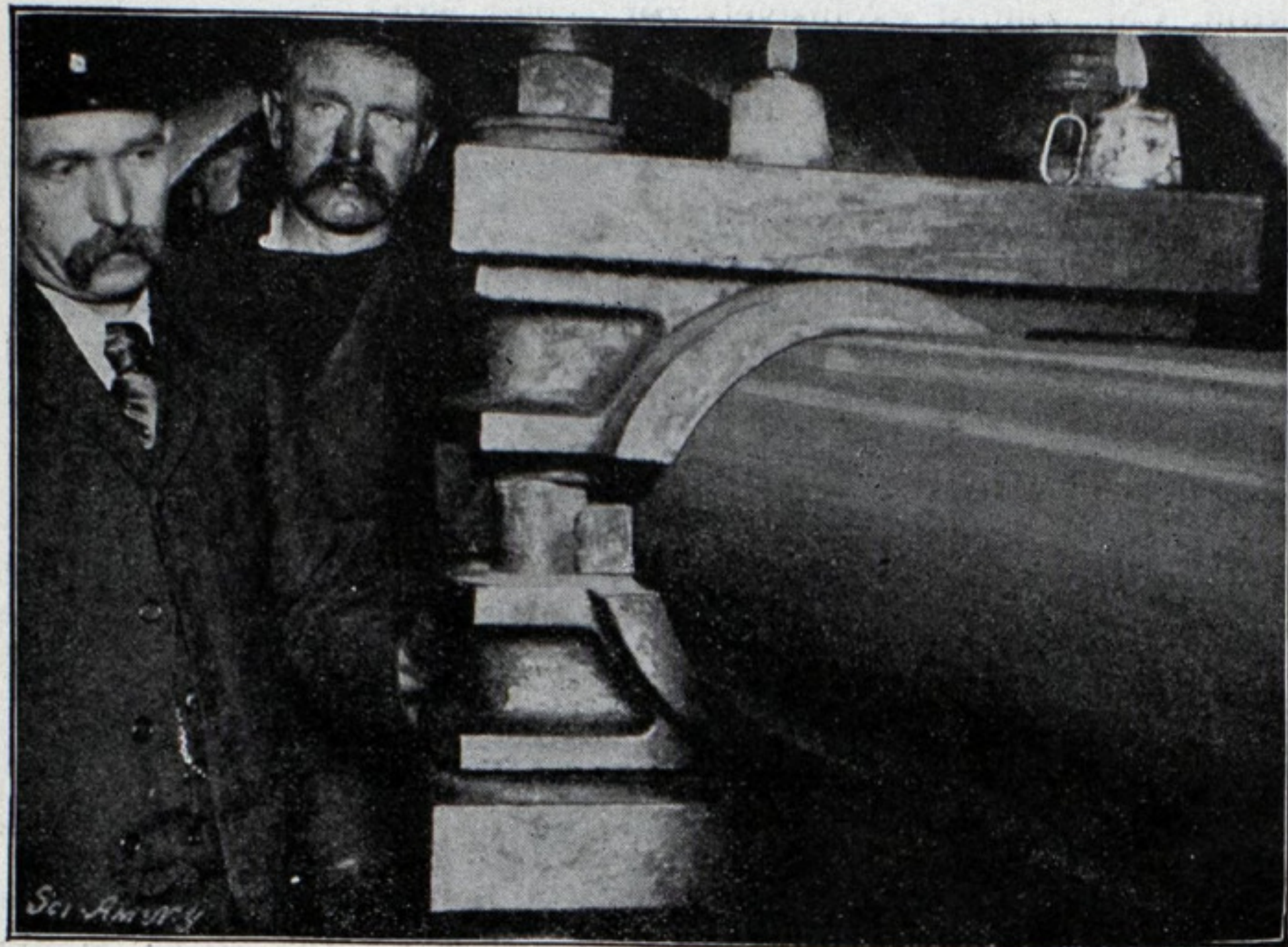
Louis Gathman of Chicago, inventor of the famous aerial torpedo gun in course of construction for the government at the works of the Bethlehem Steel Co., So. Bethlehem, Pa., and which was described at considerable length in these columns a few weeks ago, read a paper recently on powerful guns before the Boston Technology Association that is of a very interesting kind from an ordnance standpoint. The greater part of this paper appears in the Chicago Chronicle of Jan. 28.

The Chamber of Commerce of Richmond, Va., has passed a resolution endorsing the Fry-Payne shipping bill.

REPAIRING A PROPELLER SHAFT AT SEA.

There recently came limping into the port of New York, with a broken propeller shaft, the tramp steamer Manica. Her torn and battered topsides and deck fittings bore eloquent tribute to the fury of the Atlantic gale in which she all but foundered; while down in the engine room and in the shaft tunnel she bore evidence, in the shape of many an ingenious makeshift repair, to the resourceful skill and indomitable pluck with which the engine-room staff had confronted impending disaster and saved the ship.

The Manica is a freight steamer of 2,733 gross tonnage, and 11 knots speed, belonging to the Norton line. Ordinarily she runs from New York to the River Platte. On the present occasion she was on a voyage



PROPELLER SHAFT REPAIRED AT SEA WITH TWO SPARE CRANK-PIN BRASSES AND TWO CAPS AND HOLDING-DOWN BOLTS FROM MAIN ENGINE.

from Shields, England, to New York, and when about 1,600 miles from her destination she experienced very heavy weather, in which she broke her propeller shaft cleanly in two. The fracture, which occurred on the second length of intermediate shafting from the thrust block, was what is known as a "scarf" break. It began about 4 inches from the coupling and extended diagonally for 34½ inches through the shaft. The wedging effect of the forward portion of the shaft, coupled to the engine, riding over the after length, smashed three of the "stools" or plummer blocks and their caps, lifting the shafting out of its bearings. The force of the waves, as the ship rose and fell in the trough of the sea, was sufficient to drive the propeller violently against the rudder post, leaving 10 inches of opening at the point of fracture. The first thing to be done was to uncouple the after portion of the shafting and draw the broken ends together with screw bolts. Two spare crank-pin brasses were then placed around the break, two of the main-bearing caps from the main engine were placed above and below the brasses, and two spare holding-down bolts of the main bearings were used to bolt the brasses and caps together, as shown in the accompanying illustration, which was taken in the shaft tunnel after the arrival of the Manica at New York.

So far, so good. There still remained the three broken caps of the shafting in the shaft tunnel. It was impossible to replace these, and all that could be done was to utilize some sling-chains from the deck, winding several coils around the shaft and fastening them to the tunnel floor. The after portion of the shafting was then drawn up to place and the coupling-bolts inserted. Before steam could be turned on it was necessary to make some provision for holding down the main bearings, whose caps, as we have shown before, had been used to splice the break in the intermediate shaft. This was done by placing a series of large washers above the main brasses and trusting to the strength of the brasses to hold the crank shaft down in place. Steam was then turned on, and the vessel completed the remaining 1,600 miles of her voyage at a speed of 10 knots an hour, only two or three stops being necessary to tighten the bolts on the broken shaft.

The repairs were made in terrific weather, while the ship was lying helpless in the trough of the sea and was being boarded by occasional seas which smashed the upper works and found their way into the hold and the cabins. When the vessel reached New York, it was noticed that the tremendous wedging strains at the fracture caused the white metal of the brasses to squeeze out at the edges. The sling chains, whose duty it was to hold down the shafting in its bearings, were also, of course, considerably worn, in spite of the fact that they were kept thoroughly lubricated. Great credit is due Capt. C. G. Smith and Chief Engineer J. Gooding and his assistants for pulling their ship out of such an ugly and apparently hopeless predicament. We are indebted for our illustrations and particulars to Consulting Engineer A. McDermott, of New York, who had charge of the repairs.—Scientific American.

The name Marsala has been selected for the second of the steel tow barges building at the works of the Chicago Ship Building Co. for the Minnesota Steamship Co., which is represented by Pickands, Mather & Co. of Cleveland. This vessel is an exact duplicate of the Madeira, launched at the same yard a few weeks ago. She will be ready for business by the opening of navigation.

A technical publication of especial interest issued recently is the monograph on condensers which has just come from the press of the Power Publishing Co., World building, New York city. It embodies a series of lectures on the subject by F. R. Low, editor of Power, and articles of kindred nature reprinted from the columns of that periodical. The price is 50 cents.

CAPT. ALFRED B. DAVIS, U. S. REVENUE CUTTER SERVICE.

The ship owners and ship masters of the great lakes have great regard for Capt. A. B. Davis of the United States revenue cutter service, who is in charge of the St. Mary's river patrol. He has met with them

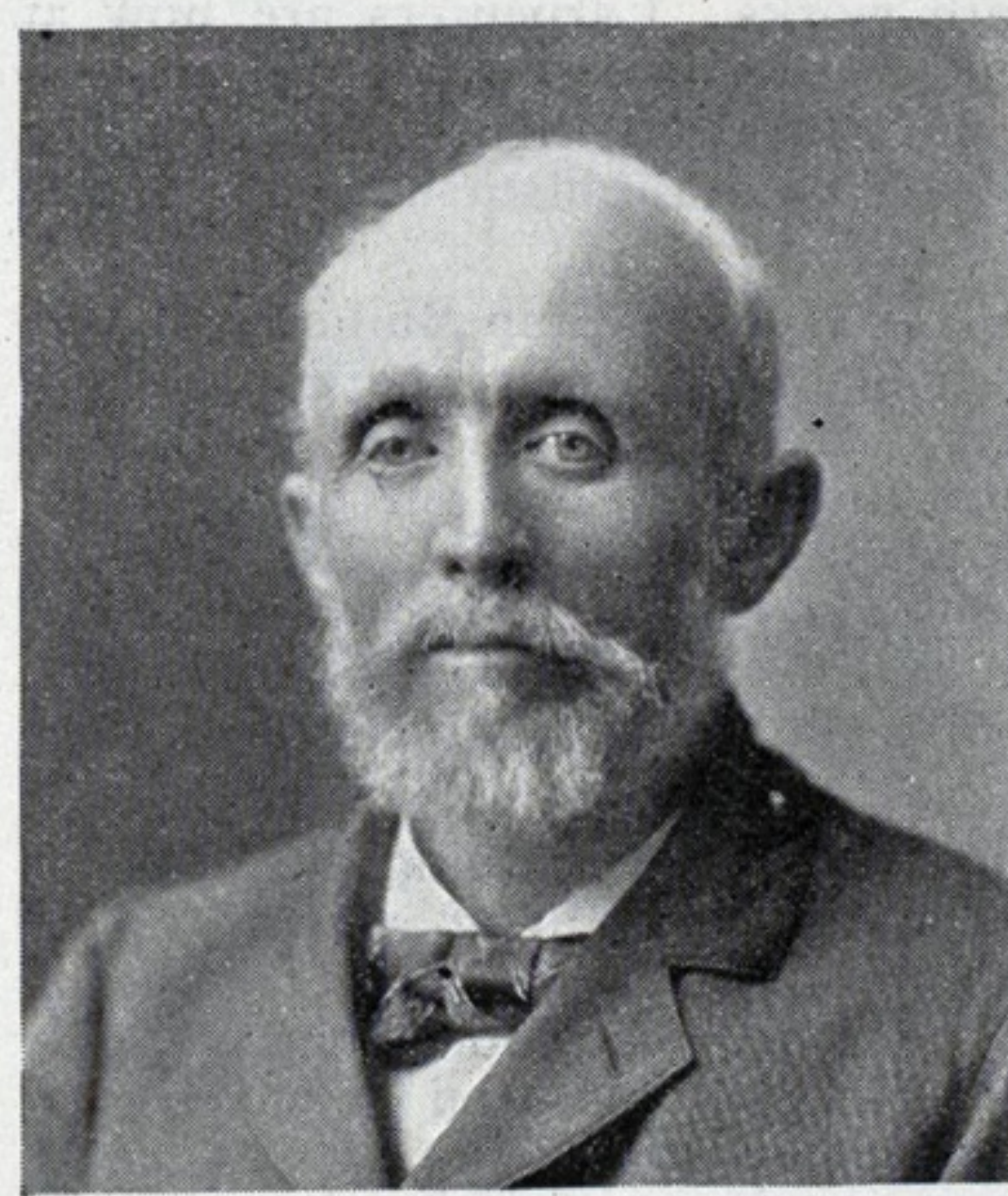


CAPT. ALFRED B. DAVIS.

at their annual conventions and has always shown a willingness to do what is best for the navigation interests in all matters coming under his jurisdiction. Capt. Davis has spent practically his entire life aboard ship. He was born in Philadelphia and his first voyage at sea as a sailor was in 1849 on the ship Emily, owned and commanded by his father. He made two voyages to the West Indies in the Emily, after which he joined the clipper ship Montauk, bound to China. The Montauk touched at Hobart Town, Van Diemens Land, and Sidney, Australia. At the latter place Capt. Davis left the ship, remaining in Sidney for a while. He returned to the United States in the American whaler Levi Starbuck of Nantucket. The passage home was long and tedious. Off Valparaiso, while in a boat trying to capture a whale, he was capsized and remained on the bottom of the boat nearly three hours before being rescued. At the age of twenty-one he commanded a bark called the Gov. Von Oxholm, a very fine vessel built in Philadelphia. He remained in the merchant service, commanding other vessels, until the civil war broke out, when on August 31, 1861, he was commissioned first-lieutenant in the United States revenue cutter service, and was promoted to captain in the same service in July, 1864. Capt. Davis has commanded quite a number of cutters and has been stationed at almost every seaport on the Atlantic coast and in the Gulf of Mexico. He has also served on the Pacific coast. In 1881 he was ordered to Milwaukee to command the revenue cutter Andrew Johnson; in 1885 was detached and sent to New York to take the revenue cutter Bear to San Francisco, and returned to Milwaukee in 1888, again assuming command of the Johnson. Capt. Davis was placed in charge of the Gresham when she was placed in commission a few years ago. This vessel was ordered to the Atlantic coast to participate in the Spanish war. He took her as far as Cleveland, when he was detached, as he was considered too old to take part in war. Then he was given command of the Fessenden, stationed at Detroit. Capt. Davis' supervision of navigation in the St. Mary's river extends back to 1896, when the regulations of the treasury department were first promulgated. His vessel at present is the revenue cutter Morrill.

THE LATE ORRIN L. JENKS.

Brief reference was made in these columns last week to the death of Orrin L. Jenks of Port Huron who was known for a great number of years as the head of the Phoenix Iron Works and later as vice-president



THE LATE ORRIN L. JENKS.

and treasurer of the Jenks Ship Building Co., which was the outgrowth of the iron works. As was said immediately after the death of Mr. Jenks, it was his ambition to see built up at Port Huron, from the beginning that was made by his father and himself with a small engine works, a large plant for the construction of steel vessels. He had made the Phoenix Iron Works one of the best shops of its kind in Michigan, and then for seven or eight years following the organization of the Jenks Ship Building Co. in 1890 he was the leading spirit in the construction of a fleet of very good wooden vessels, among them the steamer's Carpenter, Lloyd S. Porter, H. E. Runnels, Linden, Black Rock, and tugs Thompson, Vigilant, W. G. Harrow and Mason. It was certainly unfortunate that he lived only long enough to witness the beginning of steel vessel construction at Port Huron, as neither of the two steel steam freighters which were begun at the Jenks works under his direction have as yet reached the launching stage. Mr. Jenks was looked upon by the people of Port Huron as a man of progressive ideas, and public-spirited disposition, always seeking the advancement of commercial and industrial interests within the community. He was a native of Michigan and his connection with the Phoenix works dates back to 1862 when he was taken into a partnership by his father. The first marine engine built by the Phoenix works was for the steamer City of Port Huron. Mr. Jenks' interest in the ship building company will be cared for by his two sons, who have grown up in the business.

Capt. Chester Harding, United States engineer at Grand Rapids, Mich., advertises elsewhere in this issue for proposals for dredging in harbors on the east shore of Lake Michigan and for the extension and repair of piers at Frankfort, Mich.

Central Passenger Association mileage tickets are good on the Nickel Plate road between Buffalo and Chicago or intermediate stations on and after Feb. 10. 19, Mar. 2.

AMONG THE SHIP BUILDERS.

REGULAR ROUND-UP OF WHAT IS GOING ON IN DIFFERENT YARDS AROUND THE COUNTRY—A FEW NEW ORDERS.

The tug Richmond, recently completed by the Fulton Engineering & Ship Building Works of San Francisco for the Santa Fe Terminal Co., is especially designed to tow barges loaded with trains from Port Richmond to San Francisco. She is 105 feet over all, 23 feet beam, and 11½ feet depth. She is fitted with a compound engine that has cylinders 20 and 42 inches diameter and 24 inches stroke. Steam is supplied from a boiler 13 feet in diameter by 11 feet 10 inches in length at a pressure of 150 pounds. The vessel has steam steering gear, capstan and windlass and a fire pump of 18,000 gallons capacity. All the machinery, including the auxiliaries, was manufactured by the Fulton Iron Works. Extensive improvements have recently been made at this company's works and still others are contemplated. The installation of a marine railway is under consideration and dredging is now in progress so that the largest vessels may reach the company's docks for repairs.

J. L. Roberts of the Puget Sound Iron & Steel Works, Tacoma, Wash., has purchased the steam yacht Imp, built in 1890 by the Herreshoff Manufacturing Co. at Bristol, R. I. The yacht was purchased from the builders about three years ago by a party who held the contract for carrying the mail between St. Michael and Dawson, Alaska. The price paid was \$20,000 and \$11,000 more was expended in the transportation of the vessel by rail from the Atlantic coast to Puget Sound but the vessel never earned a dollar for her owner. Later she was brought back to Puget Sound and sold to Mr. Roberts. It is understood that the new owner purchased the vessel partly with a view to studying her design and that the Puget Sound Iron & Steel Works has under consideration the project of engaging in vessel building. The firm now holds the exclusive right to manufacture Sintz gasoline engines.

The new patrol steamer Vigilant, building for the supervisor of the harbor of New York was launched a few days since at Lewis Nixon's Crescent Ship Yard, Elizabeth, N. J. The christening ceremony was in the nature of an innovation, or rather a return to an early American custom, as instead of standing on the bow platform, as is generally the custom upon such occasions, the christening party took positions aboard the vessel and the young lady who wielded the champagne bottle leaned over the bow to reach the stem and broke the bottle as the vessel went down the ways. The Vigilant is practically complete, all the machinery being in place. She is 100 feet in length, 22 feet beam and 8 feet draught of water. She has unusually commodious quarters and is far in advance of the majority of yachts in the matter of steam steering gear equipment, electric and search lights and other adjuncts.

The Bath Iron Works, Bath, Me., has just opened a new draughting room, which, although not large, is said to be one of the finest in the country. The main room is 50 by 60 feet and is located on the second floor of the new office building. Careful attention has been given to arrangements for lighting the place, exceptionally large windows and a large number of electric lights being provided. The room is heated by steam, has a hardwood floor and is furnished with white pine desks, finished in spruce. The walls of the room are to be adorned with models of the various vessels built at the Bath works. Carpenters are now at work refitting the rooms just vacated by the draughtsmen of the hull department in the western end of the old office building and these will be added to the quarters already occupied by the draughtsmen of the engine department.

A charter has just been granted to the Norfolk Ship Building & Dry Dock Co. of Norfolk, Va., the purposes of which are to acquire and improve real estate, erect marine railways, warehouses, machine shops and dry docks. The capital is from \$250,000 to \$300,000 and the officers are: President, J. P. Andre Mottu of Mottu, DeWitt & Co., bankers and brokers of Norfolk; H. W. Anderson of Exeter, N. H., vice-president and general manager; J. A. C. Groner of Norfolk, secretary and treasurer. These with Henry Seymour, R. K. Cralle and B. A. Collona, all of Norfolk, compose the board of directors.

The Pusey & Jones Co. of Wilmington, Del., is going steadily forward with plans for the enlargement and improvement of its works. Of the enlargement of the drafting room and the construction of a building 40 by 115 feet in size for use as a pattern shop, etc., mention has already been made in the Review. The area of the yard has been extended considerably and arrangements are being made for the installation of an electric plant. The Webster Vacuum system of steam heating has recently been installed in the office and shops and the pneumatic tool equipment is being constantly added to.

S. D. Leach of Brewer, Me., is building a freight and passenger steamer for F. H. Hamlin of Lake View, Me. The vessel is 53 feet in length over all, 12 feet beam, 5 feet depth, and is fitted with a single engine of about 30 horse power. When completed the vessel will cost \$4,000.

It is understood that the Chesapeake Steamship Co., which has been incorporated at Baltimore by Reuben Foster, B. F. Newcomer, Harry Walters, Skipwith Wilmer and Reuben C. Foster with a capital stock of \$350,000, will build a new steamer to ply between Baltimore, Old Point Comfort and Norfolk.

A. D. Story of Essex, Mass., has secured a contract for the construction of a new steamer, the Provincetown, to run between Boston and Provincetown, and mention of which was made in the Review two weeks ago. The engines will be built at East Boston, Mass.

George A. Gilchrist has secured control of the marine railway at Skowhegan, Me., and will utilize it in the construction of a vessel of about 500 tons burden for the McQuestions of Boston, Mass.

C. F. Bennett of Washington, D. C., reports repair work at that port in excellent condition. He has now three schooners and two tugs hauled out for purposes of reconstruction.

Charles Gifford, Vineyard Haven, Mass., states that he has permanently given up the building of new vessels and will henceforth devote himself exclusively to repair work.

Matcher & Wood of Port Jefferson, Long Island, N. Y., expect to begin work within a short time on a four-masted schooner of 1,500 tons burden.

H. G. Burleigh & Bro. of Whitehall, N. Y., is not at present building any steam vessels, but has contracts on hand for three barges.

D. O. Richmond, Mystic, Conn., is building two cat boats, one with power, which is 30 feet in length, 11 feet beam and 3 feet depth.

The California Navigation & Improvement Co. is using its yard at Stockton, Cal., almost exclusively for repair work.

AROUND THE GREAT LAKES.

Robison Bros., lumber dealers of Tonawanda, now own the steamer C. H. Green and schooner Genoa.

Dunn & Madden is the name of a new firm that has opened a ship chandlery at Tonawanda. Capt. Madden is a retired vessel master and Mr. Dunn is interested in harbor tugs at Tonawanda.

Members of Marine Engineers Beneficial Association, No. 2, of Cleveland, will be entertained at a social and smoker at the rooms, No. 122 Water street, on Saturday evening, Feb. 17.

A report from Buffalo is to the effect that all the freight steamers of the Northern line are for sale. Probably there is no truth in the story, but such a move would be no more surprising than several other important transfers of vessel property that have taken place of late.

Vessels managed in the office of Hawgood & Moore, Cleveland, are owned by the Cuyahoga Transit Co., Smith Transit Co. and Eureka Transit Co. Annual meetings of all three of these companies were held Wednesday. No change was made in officers or directors.

Drake, Bartow & Co., iron ore dealers of Cleveland, have purchased from the Ohio & Pennsylvania Transit Co. of Cleveland (J. B. Zerbe and others) the wooden steamer Alcona and consort Alta. They have also chartered outright for the season the steamer John W. Moore.

Mr. D. E. Lynn, one of the well-known Lynn brothers of Port Huron, is meeting with marked success in representing the National Lead Co. of New York on the lakes. Mr. Lynn's wide circle of acquaintances covers the lakes so thoroughly that his success in any work of this kind is not at all surprising. The National Lead Co. is very probably the largest concern of its kind in the world.

Miles E. Barry of Chicago is reaching out quite extensively in the purchase of passenger and freight vessels for Lake Michigan service. Following up the purchase of the Huron steamers City of Fremont and F. & P. No. 1, which are being operated in Chicago-Milwaukee service, he has acquired the State of Michigan and has about closed for another steamer, these two latter to be placed on the Chicago-Muskegon route under the name Chicago & Muskegon Transportation Co.

Customs officials have been informed by the treasury department, Washington, that inspection fees and dues assessed by the Canadian government on American steam vessels since Jan. 1, 1898, will be refunded to the owners of vessels by the United States government on proper presentation of claims to the department. It appears that there were reciprocal arrangements between the two governments relative to the inspection of steam vessels of both countries, which was not lived up to by the Canadians. The department has therefore determined to refund the amounts demanded and collected from American owners.

At the last annual meeting of the Lake Carriers' Association a resolution was adopted recommending that the government provide a new revenue cutter suited to St. Mary's river patrol service. A bill with that end in view was introduced in congress and it has been favorably reported to the senate by the commerce committee of that body. The vessel, if built, will cost about \$75,000. Wm. Penn Nixon, collector of customs at Chicago, also wants a new revenue cutter—one suited to Chicago harbor service. The Calumet, a vessel built especially for Chicago harbor service, was taken to the coast during the Spanish war.

It is announced from Cincinnati that the United States circuit court of appeals, sixth circuit, has affirmed the decision of Judge Ricks of the district court, Cleveland, in the Choctaw-Waldo collision case. The Waldo, owned by the Roby Trans. Co. of Detroit, collided with the Choctaw, owned by the Lake Superior Iron Co. of Cleveland, near the Sault in the morning of May 20, 1896. After a trial in Cleveland lasting about three weeks, Judge Ricks found the Waldo solely at fault. The damages amount to about \$27,000. If the opinion of the circuit court contains any points of law that are of special interest, they will be summarized in these columns as soon as time will permit.

A short time ago the Lake Carriers' Association and the Ship Masters' Association requested Congressman Burton of Ohio to secure the transfer of light-ship No. 55 from Simmons reef, Straits of Mackinaw, to Lansing shoal, and the transfer of the gas buoy on Lansing shoal to Simmons reef. As Lansing shoal marks an important turning point for all vessels bound to and from Escanaba, it is agreed that the light-ship with its fog signal will be of greater service at that point than on Simmons reef, especially as there is a light-ship on White shoal, which is in the vicinity of Simmons reef. It is also the desire of the vessel men to have the light-ship on Gray's reef near the Straits changed to a point about 1½ miles south of its present location, so as to cover a spot that has only 18 feet of water over it and which is not covered by the light-ship as now located. As it will be necessary to have an act of congress to make these changes in stations of light-ships, Mr. Burton has introduced a bill with that in view.

Lieutenant Commander A. B. Willets, U. S. N., was recently re-elected secretary and treasurer of the American Society of Naval Engineers. A mistake was made in the name and title of this officer of the society in recent reference to the annual meeting.

SHEATHING OF SHIPS. 0782

THIS IMPORTANT QUESTION REGARDING NEW VESSELS OF WAR IS NOW UP TO CONGRESS—NO DIVISION OF EXPERT OPINION AS TO WHAT SHOULD BE DONE REGARDING ARMOR—COALING STATIONS.

WASHINGTON BUREAU, MARINE REVIEW, 1345 PENNSYLVANIA AVENUE, WASHINGTON, D. C., FEBRUARY 14, 1900.

Until congress passes upon the question of sheathing for ships of the navy no further progress can be made toward the designing of the new battleships and armored cruisers authorized more than a year ago. The sheathing subject is now before the two naval committees. Secretary Long has recommended that the report of the majority of the naval board of construction, which is against sheathing, be followed. Whatever action is taken by congress will probably be provided in the annual naval appropriation bill, which usually does not pass both houses until well along near the close of the session. Rear Admiral Hichborn says that it will be a useless expenditure of money and a waste of time to begin the plans of battleships which may be entirely changed by the course which congress may pursue. Hichborn is the sole advocate of the plan adopted last year for the sheathing of the ships.

The board of naval construction in its report against sheathing said that the argument in favor of sheathing is that the bottom of a ship will not foul to so great an extent as when not sheathed and that therefore the vessels should be better able to maintain their speed on moderate coal consumption and save expenses in docking and painting. But against these advantages they place as disadvantages heavily increased first cost; very difficult form of construction, in which our ship builders have little or no experience; difficult and expensive repairs; danger of injury to hull plates from bad sheathing; additional weight of sheathing which might be given up to coal or armor; increased volume to drive through the water; great difficulty in attaching sheathing to the armor plates, and the lack of East India teak, the best wood for sheathing, in this country. Rear Admiral Hichborn's answer to all this is of a very vigorous kind and not least of the points to which he takes exception is the assertion that our ship builders have little or no experience in sheathing. He directs attention to the fact that we have already in the United States navy six sheathed vessels and that six others are under construction and then adds: "To imply that we cannot do in the United States what has been done for twenty years abroad notwithstanding the knowledge that has come to us of foreign practices is, in my opinion, a reflection upon the ability of our own ship builders and mechanics, than whom there are none more capable the world over." But as the matter is now in the hands of the naval committees and as the secretary has approved the recommendation of the majority not much will probably be heard of it for some time in the department.

A letter to Chief Hichborn on this subject from Capt. J. B. Estes of Charlotte, N. J., is quite interesting. He says: "I notice in the press that the board of construction does not see the advantage of sheathing ships' bottoms. Thirty years ago I recommended to the company operating the Royal Mail line of steamers (iron) that they sheathe the bottoms of their vessels just above the bilge. They did not heed my advice, but in ten years after I made the suggestion they had sunk in the rapids of the St. Lawrence river fifteen of their steamers. The expense of raising these vessels averaged about \$80,000. At last two of the directors called on me and asked what could be done. I at once replied, sheathe with 4-inch rock elm. One was of the opinion that the vessels would draw more water. On the contrary they drew on an average 2 inches less. Since they adopted the sheathing not one boat has been sunk. My argument is that with the iron for a backer and the wood for a fender you have the best bottom that floats. Pardon me for taking up your time, but I feel so much interested in our beautiful navy that I can not refrain from offering what I know about the sheathing of steamers."

EXPERTS NOT DIVIDED ON THE ARMOR QUESTION.

Rear Admiral O'Neil, chief of the ordnance bureau, has received no intimation as yet from either naval committee relating to the probable time when the armor question may come up for consideration. Testimony on the cost of armor making, the construction of a government factory and practically all facts pertaining to the armor question have been so exhaustively presented to each committee that the naval experts contend that no new light can be thrown on the subject and that so far as the firms are concerned they stand as they did one year ago and will not budge an inch. Until congress is willing to authorize the purchase of plates the construction of war ships will stagnate.

Admiral O'Neil says that good Harvey armor can be purchased for about \$412 a ton, but that the new armor treated by the Krupp process cannot be had for less than \$547 a ton. He strongly advocates the latter armor for the navy and says that with this grade ships can be afforded better protection and have armor placed over all area of the ships, owing to the plates being lighter than those treated with the Harvey process. The battleships of the Indiana class have side armor of 18 inches around the belt, but it is not proposed to protect any of the new vessels with armor heavier than 15 inches, which, it is believed, will give the same, if not more effectiveness, owing to its superior tensile strength and resisting powers. Admiral O'Neil contends that the American navy, which has assumed a position among the nations of the earth for superior armor and ordnance, cannot afford to accept an inferior plate for the finest ships it is to build, even though the price is considerably in excess of that paid for armor protecting the sides of the Indiana type of vessels. There is no division among the experts on the armor question but a unanimous sentiment that congress should authorize the purchase of the best armor in the market.

NEW COALING STATIONS.

Rear Admiral Bradford, chief of the bureau of equipment, has made preliminary arrangements for the establishment of coaling stations at the following named places on the Atlantic coast and the Gulf of Mexico: Frenchman's Bay, Me., Portland, Me., Portsmouth, N. H., Boston, New London, in the vicinity of Newport, New York, League Island, Pa.,

Chesapeake Bay, Port Royal, S. C., Key West and Dry Tortugas, Fla., and New Orleans, La. It is also contemplated to establish coaling stations at Mission Rock, Cal., Pearl Harbor, and Honolulu in Hawaii, and at Copras Island in the harbor of San Luis de Apra, Guam.

NOVEL LECTURE ON SHIP BUILDING.

Naval Constructor Wm. H. Varney, who is looking after the construction of vessels at the works of the Harlan & Hollingsworth Co., Wilmington, Del., at the Columbian Iron Works of Baltimore, and at the Maryland Steel Co.'s works, managed to make up for a large gathering of Baltimore people at the headquarters of the Y. M. C. A. a very interesting lecture on ship building. Mr. Varney first made a comparison between the bible dimensions of Noah's ark, 21.6 inches for a cubit, and the new North German ship Deutschland. This was followed by views, first of the primitive mode of crossing the river, a savage on a log; then the canoe, and from that the development of the Nile boat or galley of 2500 years B. C.; then the Greek man-of-war 700 years B. C.; then from the Carthaginian, 533 years B. C., to the Chinese vessel of A. D. 1100; then the model of the Santa Maria of 1492, as sent to the Chicago exposition, as well as the Viking, the piratical ship of the middle ages, and the British ship-of-the-line, A. D. 1610. The modern system of building ships was compared with the ancient system. The ancient system, as shown, was to set up the stem and stern post and a few frames and bending battens, filling in with timbers as is done by some builders of small boats at the present time. Compared with this was the modern system of construction, showing mould loft and describing it with a few sketches of the manner of laying down vessels in the mould loft and transferring to the scribe board. Body plans on the scribe board were also shown and then the bending floor for iron vessels with the workmen bending a hot angle bar. Following this was the frame bent complete, and then the keel blocks, as well as the manner of erecting the ship from the keel blocks, including the various parts of framing up to the launching, the different methods of launching, etc.

The Deutschland of 1847 was compared with the new Deutschland and the American liner City of Paris with a side-wheel steamer of the type of 1848; the man-of-war Jamestown, as built at Norfolk in 1844 with the Baltimore of today and the Constitution of 1812 fame (built at Boston in 1797) with the Oregon of 1898. Drawn on the screen also were other men-of-war, namely, the Indiana, Atlanta, Minneapolis, New York, Dolphin, torpedo boat McKee, submarine boat Holland on the surface and submerged, and the Katahdin in the naval review in New York harbor in 1898. Other illustrations were results of the hurricane of March 16, 1889, at Samoa harbor, in which the Trenton and Vandalia were wrecked and the German vessels of that wreck thrown over upon their sides. Illustrations of the yachts Defender and Valkarie were also included in the collection on account of their showing full spread of sail under way.

NEW SHELBY STEEL TUBE CO.

The Shelby Steel Tube Co., with general offices in Cleveland and capital stock of \$7,376,400, formed in 1897 by the consolidation of the seamless tube companies of the Central West, has been reorganized in the past week as a New Jersey corporation under the same name. The authorized capital stock is \$15,000,000—\$6,000,000 preferred and \$9,000,000 common stock.

The directors include R. L. Coleman, president of the American Bicycle Co. and A. A. Pope and H. A. Lozier, who are directors of that company. The other directors are: W. E. Miller, Cleveland; B. J. Williams, Shelby, O.; E. W. Bliss, Brooklyn, N. Y.; L. S. Hoyt, New Castle, Pa.; John L. McKinney, Titusville, Pa.; F. J. Carolan, San Francisco, Cal.; Frank O. Lowden, Chicago; James B. Dill, East Orange, N. J. It is expected that the officers of the old company will take charge of the new company. They are: President, W. E. Miller; treasurer, W. S. Miller; secretary, H. H. Cockley; N. A. Gilbert will be general counsel.

Companies and plants included in the new corporation are the following: New Castle Tube Co.; McCool Tube Co.; Auburn Nut & Bolt Works; Hercules Seamless Tube Co.; Pope Tube Co., absorbed in 1899. The tubing end of the business of the United States Projectile Co., Ellwood Weldless Tube Co., Greenville Tube Co., American Weldless Tubing Co. of Toledo, Brewer Seamless Tubing Co. of Toledo, United States Standard Drawn Steel Co. of Cuyahoga Falls, O., Shelby Steel Tube Co. of Ohio and the Albany Mfg. Co. of Albany, Ind., absorbed in 1899; also the tubing end of the business of the Mansfield Machine Works.

INSTRUCTION IN MARINE ENGINEERING.

Among other new projects recently decided upon by the trustees of Columbia University is one for the establishment of courses in marine engineering and naval architecture. The decision was reached as the result of a general realization of the fact that a new era in American ship building has dawned, but it is said that it was primarily upon the suggestion of Rear Admiral Melville that the trustees decided to place naval architecture in the curriculum of the School of Mechanical Engineering. Prof. Cathcart, formerly of the United States navy, will be the head of the new department. The course will be optional to scientific students and will include boiler design, marine auxiliaries, appliances, materials and propelling machinery, as well as architectural design and mold-loft practice. Designs for special vessels and machinery will be required as a graduation thesis from candidates for degrees. Speaking of the extension of the department's work President Low of Columbia said recently: "I share the opinion of the faculty that it is highly important for the university to preempt the field of marine engineering without delay."

Chairman Kimball of the Norfolk & Western directorate is authority for the statement that the passage of the shipping bill means the establishment by his line of a bi-weekly steamship service between Norfolk and South American ports and he also believes that it means the establishment of an additional ship building plant at Norfolk. The board of trade of Norfolk has adopted resolutions urgently recommending the passage of the bill.

POSITION OF NAVY DEPARTMENT REGARDING HOLLAND.

Washington, D. C., Feb. 14—In order to set the navy department right on the subject of the submarine boat controversy, Secretary Long has written the following letter in reply to an inquiry:

"I have the honor to acknowledge the receipt of your letter relative to the report of the board of construction and the proposal of the Holland Torpedo Boat Co. to sell to the government its submarine torpedo boat Holland and build for it another vessel of similar type or to construct two such new boats. In reply I have to say that the department has given and will continue to give the matter careful attention, feeling that though this sort of vessel is still in experimental stage it is entitled, in the interest of naval construction and enterprise, to thorough consideration. Indeed the department made a contract with the Holland company as long ago as March 12, 1895, for the construction of one of its submarine boats, the Plunger, which has not yet been finished, although the time for its completion expired several years ago.

"During the Spanish war the department had an examination made of the Holland, and after correspondence with the company complied with a request in a letter to it, dated May 3, 1898, to order a board to witness a trial of that boat. In accordance with the recommendation of the board of construction, certain requirements were named which the boat ought to fulfill. It was found, however, that this trial could not be made by the company as soon as expected and under date of June 15, 1898, the requirements aforesaid were somewhat modified, as set forth in a letter to the company of that date in which was embodied the following clause to wit: 'It is to be distinctly understood that the department is to be at no expense on account of said tests, aside from furnishing the Whitehead torpedo for use during the same, nor does the department by consenting to witness such further tests in any way commit itself as to its further action concerning the Holland submarine boat.'

"The board selected by the department was the board of inspection and survey. The trial was made Nov. 12, 1898. The boat was then found deficient in several respects. After correspondence with the company it was decided that the board should witness a further trial, and this, after several postponements, was made Nov. 6, 1899. It was then found that the boat made a very creditable showing and under date of the 23rd of that month the company submitted its proposition above mentioned. You are in error in the impression that the members of the board of construction, to which this whole matter was referred—and no more competent board could be selected—are hostile to the adoption of any form of submarine boat for the naval service. I am sure that with better knowledge of them and of their faithful discharge of any duty assigned them you will gladly recall your suggestion that they have made an unfair and unjust report. They are cautious not to recommend haste in this matter until the interests of the government are properly guarded by securing the best practical development. The report of the majority of the board which is less favorable to the company than that of the chief constructor, who is a member of the board, simply recommends that no further contract shall be made until the company shall have made some satisfactory settlement concerning the delivery of the submarine boat Plunger above referred to, the contract for which required its completion within twelve months from March 12, 1895.

"Under the contract for the Plunger the sum of \$99,716.50 has already been paid. The majority report suggests that when the Plunger matter shall have been satisfactorily settled it will be time enough to consider the company's present proposal, and that in case of such adjustment the department will be justified, if the law permits, in making a contract, under proper guarantees and specifications, for one vessel of the larger size offered by the company and in thus aiding in the development of the submarine boats. The question raised by the board is simply one as to the wisdom of making contracts for more than one of these boats under present circumstances. In this connection it should be borne in mind that the requirements suggested by the department for fulfillment by the Holland were not of the nature of agreement to accept her if she should meet them and that therefore the government is not only under no obligation to buy her because of her performance of them, but is not in any way committed to such an obligation.

"The majority of the board of construction purposely refrained from any criticism or discussion of the merits of the Holland or of the possibilities of submarine boats in general, but it is difficult to escape their conclusion that it would not be a profitable business transaction to buy the Holland at the same price, \$175,000, for which the company offers to build new and larger boats. In view of the matters herein set forth I am convinced that you will see that the action of the board of construction has been misapprehended by you and the interests of the Holland Torpedo Boat Co. are not unjustly affected by its recommendations. The department by no means regards the matter as concluded, but holds it in abeyance for the present, desiring additional light. It is possible that this may be derived from the further tests which are to be made of the Holland in this city at an early date."

In connection with the foregoing, Mr. Elihu Frost, representing the Holland company, says that plans for changes in the Plunger have almost been completed by the company and that work will be begun on the boat at once. The Plunger will probably be taken from the Columbian Iron works at Baltimore and removed to the Nixon Ship Yard at Elizabeth, N. J. Mr. Frost says that the work of changing the Plunger's motive power will be completed within seven months. Mr. Frost has submitted to Lieut. Commander de Faramond de Lafajole, naval attaché of the French embassy, a proposition for the building of a submarine torpedo boat for the French government. Mr. Frost says that the proposition is to build a duplicate, or practically a duplicate, of the Holland. The French government recently authorized the building of twenty-four submarine boats. Lieut. Lafajole has made several submerged trips in the Holland and is much pleased with the boat's performance.

Central Passenger Association mileage tickets—The Nickel Plate road has become a member of the mileage ticket bureau of the Central Passenger Association and all mileage tickets properly issued by any line, a member of that bureau, are valid for use on that road on and after Feb. 10, in the same manner as on other roads, members of that bureau.

17, Mar. 2.

MORE GERMAN SHIPPING PROGRESS.

In connection with the shipping legislation now proposed in congress it may be of interest to note a few of the more important items on the score of subsidies that are constantly appearing in European journals. The Board of Trade Journal of London says:

"The extension of German shipping in the east has received a considerable impetus from the recent purchase, by the North German Lloyd Co., of the fourteen steamers of 20,942 registered tons belonging to the Scotch Oriental Steamship Co. This large acquisition is said to now throw the main portion of the coasting trade of Southeast Asia into German hands. The newly acquired line will, as before, serve Bangkok, Singapore, Hongkong and Swatau, only, with great frequency. In this region the Germans had already previously bought twelve steamers from a former Dutch company; so that there will now be a large fleet of German vessels in those waters. It is pointed out in the press that there will now altogether be some forty German vessels employed on the various eastern lines; that they will be under one management, and that it clearly shows the advantages of the policy of establishing Imperial mail lines to which other subsidiary undertakings can so easily be attached by degrees. Attention is also called to the German steamer traffic on the Yangtze-Kiang, whereby a valuable network of purely German shipping communications has been established. In this connection it is of interest to observe also that the North German Lloyd this year extend their line of freight steamers between Hamburg and Bombay and Calcutta, and establish as well a special freight line between Italy and New York from April 1 next."

It is also announced in the Shipping Gazette of London that the Jamaica government has accepted the proposal of Messrs. Elder, Dempster & Co. for the establishment of a direct steamship service between Jamaica and England, the company to receive a subsidy of £40,000 a year of which the Imperial government will pay half. The Times' correspondent at Kingston (Jamaica), referring to this same matter says:

"Messrs. Elder, Dempster & Co.'s terms for the establishment of a direct steamship service between Jamaica and England were a subsidy of £40,000 annually for ten years, or £20,000 if the larger steamers were not utilized after three years. Mr. Chamberlain telegraphed that the Imperial treasury would pay half if the colony contributed the remainder. The firm pressing for an immediate answer, the governor canvassed the island by letter and telegram. The mercantile community whose interests lie in the United States wished the terms to be rejected, but the great body of producers, as I anticipated, favored the acceptance, saying that they were willing to pay a tax on fruit to meet the subsidy. The privy council, therefore, decided to accept the offer on the understanding that the draft agreement should be submitted to their approval. They also urged that the subsidy to the Royal Mail Co. should be abolished or considerably reduced. Mr. Chamberlain has been informed of the decision."

COST OF STEAM YACHTS.

William A. Fairburn, naval architect and marine engineer with the Bath Iron Works, in an able and interesting article published in Marine Engineering on the "Design and Construction of Steam Yachts," says:

"The cost of a steam yacht is a very variable quantity, as fully 40 per cent of the cost may be due to the owner's whims and fancies in selecting magnificent furnishings. But few people have any conception of the cost of a steam yacht. Even a little steam or naphtha launch costs from \$1,000 to \$5,000. A small steam yacht like the Oberon costs about \$7,000, and this vessel is no larger than many a launch. A yacht fit for fair weather coasting is very cheap at \$18,000, and the majority of this class exceed this figure by a good deal. It is said that the Illawarra, 106 feet long and 12 knots speed, cost about \$60,000; the Free Lance, 108 feet long and 16 knots, \$65,000; the Peregrin, 131 feet long and 14 knots, \$95,000; the Electra, \$125,000; and the builders of the Atalanta, Eleanor and the old Corsair, now U. S. S. Gloucester, received about \$200,000 each for the construction of these vessels. It is said that John Jacob Astor paid \$240,000 for the Nourmahal; the Varuna cost Eugene Higgins about \$300,000, and the yacht Aphrodite has cost Col. O. H. Payne at least \$360,000. These prices are for the boats complete, with the exception of the fittings, furnishings and equipment furnished by the owner. The largest yachts afloat today are probably worth from \$400,000 to \$600,000 complete with all furnishings on board. But initial cost is not all that must be considered, for it costs a fortune every year to keep any of these large pleasure craft in commission, the running expenses of the larger vessels varying from \$8,000 to \$15,000 per month, and sometimes when there is much entertaining, even more."

SHIPPING LEGISLATION.

A Washington dispatch announces that the house committee on merchant marine and fisheries has agreed to report favorably house bill 5065 to extend the navigation laws over the Hawaiian islands, and house bill 5067 concerning the boarding of vessels, both of which measures were introduced by Mr. Grosvenor. The only change made in the bill to extend the navigation laws to the Hawaiian islands was one providing that the act shall not take effect until one year after its passage. As soon as this law takes effect vessels owned in Hawaii on July 7, 1898, and which continue to be so owned, will receive United States registry and may engage in the coasting trade, while only United States vessels can engage in the trade between this country and the Hawaiian islands.

The bill concerning the boarding of vessels gives the secretary of the treasury the power to make regulations and to enforce them in regard to boarding vessels on their arrival in ports of the United States. Any person going on board of a vessel in defiance of such regulations will be subject to fine and imprisonment. This is to meet cases where vessels coming from foreign ports are boarded by persons who want to see friends or do other things, to carry out which purpose they now defy the law and for which no proper penalties are now imposed.

A Philadelphia correspondent makes inquiry as to the greatest draught of war vessels. The vessel of deepest draught in the United States navy is the Oregon, which draws 27 feet 1 inch.

PINTSCH GAS--ITS VARIED USES.

Washington, D. C., Feb. 14.—Wm. St. John, who visits Washington occasionally in the interest of the Safety Car Heating & Lighting Co., the New York corporation that controls the Pintsch light system in America, takes great pleasure in showing to visitors at the capital the gas works of his company, of which there are fifty-one throughout the United States, and in explaining the extensive interests that are supplied from these works. It is well known, of course, that the gas buoys with which vessel men are so well acquainted represent only a very small part of the operations of this large institution. The capital of this company was recently increased to \$5,000,000, due largely to the fact that a surplus of \$1,250,000 had been accumulated in its treasury on an original capital of \$2,500,000.

There are now in the United States 14,311 cars equipped with the Pintsch system of lighting, and these cars are in service on 129 different railroads. The company's fifty-one gas works are so located throughout the country that there is now no trip in which a passenger coach might be employed, no matter how long, but what Pintsch light can be secured at all necessary points. There are also in service in the United States 125 Pintsch-lighted buoys and six beacons, as well as two light-house tenders which are equipped with compressors and storeholders for supplying the buoys and beacons. The company also controls a remarkable combination gas light and bell buoy, which has been received with a great deal of favor.

The application of Pintsch gas for cooking purposes on railroad trains is another department that has been recently developed. This feature has proved a great boon to the commissary departments of the various railroads and palace car companies. The heating systems owned by this company have been adopted as the standard by ninety-four of the principal railroads of the country, as well as by the great Pullman Co. Various systems are employed, including two styles of hot water circulation, which is effected by means of steam jackets, and also three or four different systems of direct steam.

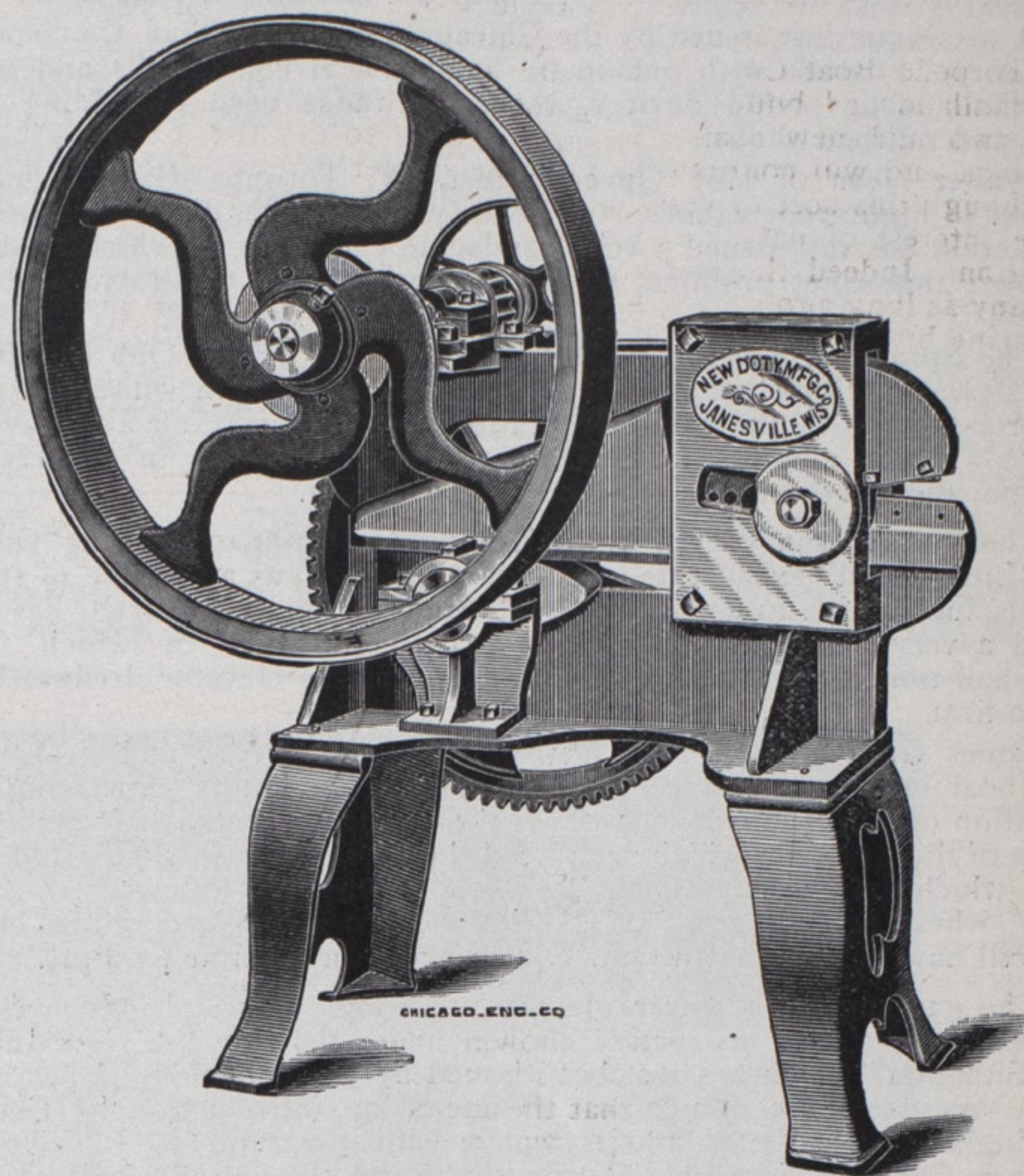
Included among the cities and towns in which the fifty-one gas works above referred to are located are Atlanta, Baltimore, Boston, Buffalo, Camden, N. J.; Chattanooga, Chicago, Cincinnati, Cleveland, Columbus, Council Bluffs, Denver, Detroit, Ft. Worth, Hamlet, N. C.; Houston, Tex.; Hoboken, Indianapolis, Jacksonville, Fla.; Jersey City (2), Kansas City, Long Island City, Marion, O.; Memphis, Minneapolis, Mobile, Montreal, New Haven, New York City, Oakland, Cal.; Ogden, Philadelphia, Phillipsburg, Pittsburg, Portland, Ore., Savannah, St. Louis, Syracuse, Texarkana (2), Toledo, Washington, D. C., Weehawken.

The Quincy Marine Ways, Quincy, Ill., has been kept busy this winter docking and repairing dredge boats, towboats and barges and has no new work on hand.

If you hold a Central Passenger Association mileage ticket use it on trains of the Nickel Plate road on and after Feb. 10. 20, Mar. 2.

POWER SHEARS FOR BAR IRON.

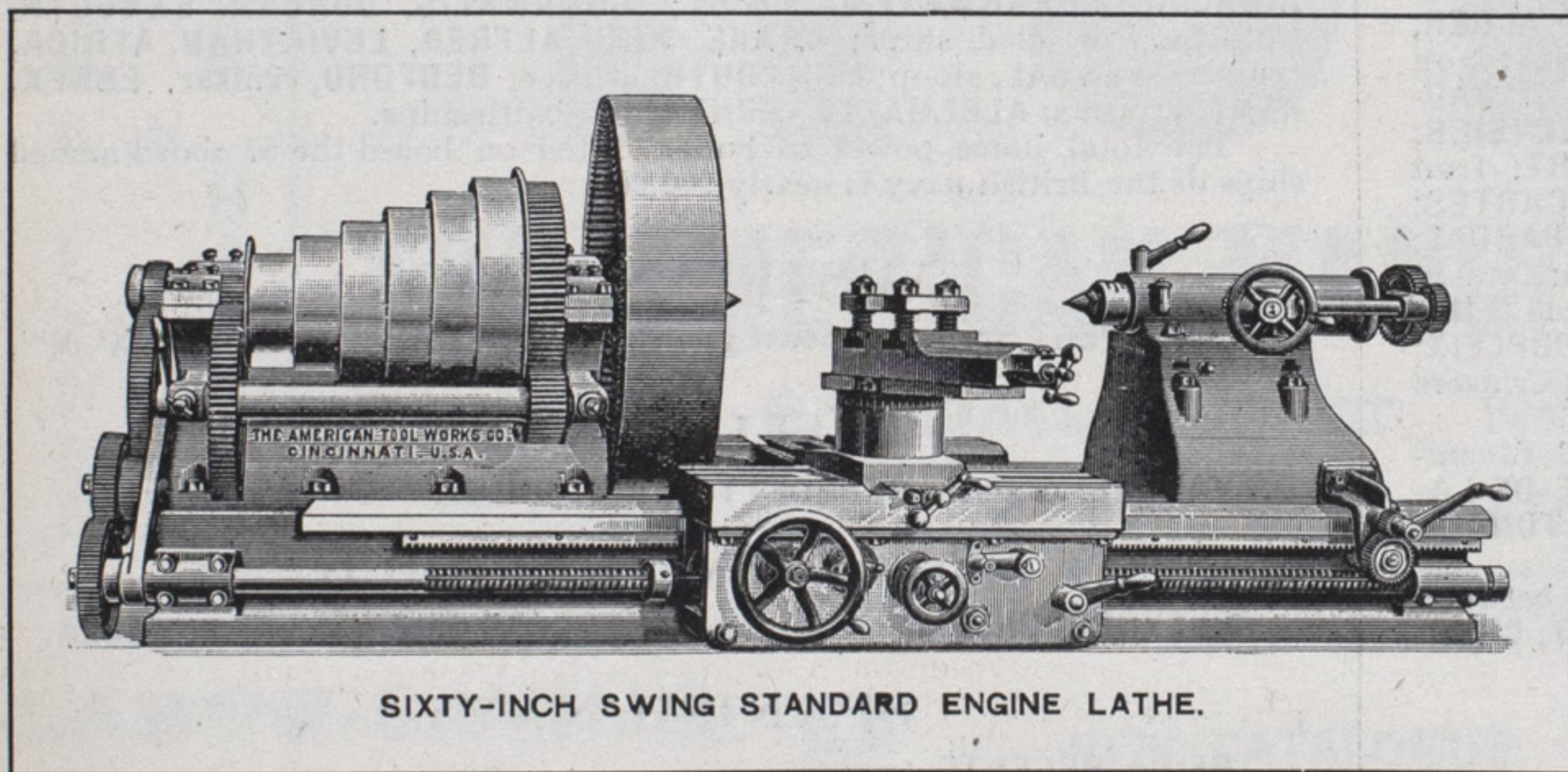
The engraving herewith represents a shearing machine built in six sizes by the New Doty Manufacturing Co., Janesville, Wis. These machines are built especially for cutting bar iron—round and flat—and the



smallest, weighing 600 pounds, is capable of cutting 1-inch round iron and 3x½-inch flat iron. The largest, weighing 10,000 pounds, is capable of cutting 3-inch round and 6x2-inch flat iron.

As will be seen, the machine consists essentially of a shear lever moved by a cam, which is on a shaft passing through under a lever. This shaft is driven by suitable gear wheels from a second shaft, which carries the flywheel, the clutch and driving pulley. The blades for cutting flat bars and those for round iron are on opposite sides of the lever fulcrum, both being always in place and ready for use. The gearing is proportioned ten to one, and all parts are made strong to resist the greatest strain which can be brought upon them.

52" AND 60' Swing Standard Engine Lathes



SIXTY-INCH SWING STANDARD ENGINE LATHE.

WE show herewith an illustration of our 52-inch and 60-inch Swing Standard Engine Lathes. These tools have all the latest improvements.

We are also builders of a complete line of high-grade tools for Machine Shop Equipment.

The American Tool Works Company,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway,
Geo. Place, Agent.

NEW ORLEANS: The Fairbanks Co.

CHICAGO STORE: 68-70 South Canal Street.

PHILADELPHIA: The Fairbanks Co.

CLEVELAND: The Strong, Carlisle & Hammond Co.

BOSTON STORE: 36 Federal Street.

BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.

DENVER AND SALT LAKE CITY: The Mine & Smelter
Supply Co.

LONDON: Alfred Herbert, Ltd., 7 Leonard St.,
Finsbury, E. C.

DUSSELDORF: de Fries & Co., Act. Ges.,
Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Frères, 33 Rue des Peignes.

BERLIN: de Fries & Co., Act. Ges.,
Kloster Strasse, 13-15.

PARIS: Roux Frères & Cie., 54 Boulevard
du Temple.

MOSCOW: Alfred Stucken.

TRADE NOTES.

The H. B. Plant, recently built by the Merrill Stevens Engineering Co., Jacksonville, Fla., was equipped with the Burnham steam pumps manufactured by the Union Steam Pump Co. of Battle Creek, Mich.

A catalogue just issued by the Chicago Pneumatic Tool Co. (special edition No. 9) deals with pneumatic hammers, riveters, drills and other pneumatic labor saving devices, especially those used in leading ship yards and railroad shops.

Walter Dean of 1751 Queen Street, W. Toronto, Canada, manufacturer of high grade canoes, row boats, yachts, skiffs, dinghys and other small craft, has just issued a very handsome catalogue in which many of the more important products of his boat works are illustrated and described.

The Sprague Electric Co. has equipped one of the Old Dominion Line steamers with a quantity of Lundell fans finished in white and gold to correspond with the cabin decorations. They make an attractive as well as a useful addition. The fans are mounted to run in an inverted position, the motors being attached to the ceiling.

The Vulcan Iron Works Co. of Toledo, O., manufacturers of "Giant" and "Little Giant" excavators, dredges, etc., as well as a full line of steam shovels such as are in use in the Lake Superior mining district, has just issued a very handsome calendar, a prominent feature of which is a large half-tone illustration representing one of the elevator dredges built by the firm.

James Graham & Co. of Detroit, shippers of coal and dealers in steamboat fuel, have received a large number of letters expressing appreciation of a unique calendar which they issued recently. It embodies a map of the world on which are traced the present ocean routes and also those which may be expected to be most extensively followed ten years hence, when, according to an inscription across the face of the chart, "we will have a merchant marine and markets for all time to come."

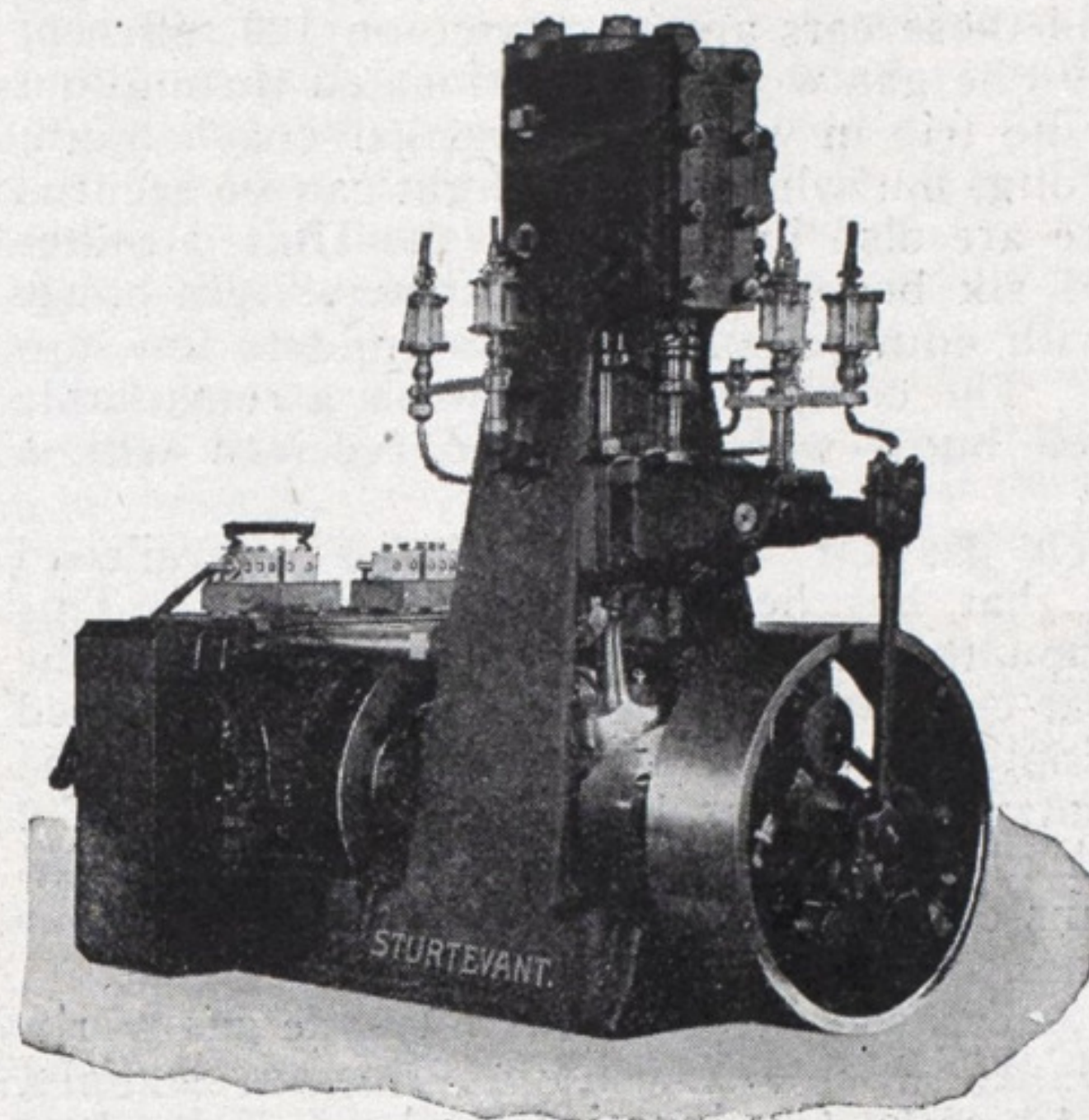
The gas engine in power plants—its various uses and influences—is the subject of a very instructive booklet under the title "A New Industrial Situation" which has just been issued by the publishing department of the Westinghouse companies. There is an introduction by George Westinghouse and the volume is replete with illustrations. It is not an ordinary trade publication, but one that certainly presents, as its title suggests, a new industrial situation that should have the attention of every manufacturer in the country.

Kenney flushometers for flushing water closets, which are manufactured by the Kenney Co., No. 72 Trinity Place, New York City, are certainly making great headway on shipboard. During the past year this system has been installed on thirteen of the refitted United States army

transports, as well as on Col. O. H. Payne's steam yacht Aphrodite, the new coast survey steamer Pathfinder and the steamer Chester W. Chapin. Of the vessels turned out on the great lakes during 1899 which have been fitted with flushometers may be mentioned the steamers Illinois, Pennsylvania, Angeline, Toronto, M. A. Hanna, Douglas Houghton, H. C. Frick, Malietoa, Mae and Porto Rico. The Kenney system is also being installed in the department of machinery and electricity at the Paris exposition.

A SMALL LIGHTING SET.

We illustrate in the accompanying engraving a very small generating set, designed primarily for lighting purposes, and built by the B. F. Sturtevant Co. of Boston, Mass.



The engine has a cylinder 3 inches in diameter, and a stroke of $2\frac{1}{2}$ inches. It is self contained, as is clearly indicated, and the speed is regulated by shaft governor. The valve is of the piston type. All bearings are adjustable and are provided with direct oiling devices. A speed of 800 revolutions a minute is attainable, and may be constantly maintained with accurate regulation.

The generator is of $2\frac{1}{4}$ K. W. size, designed to develop its rated output without sparking, and with a minimum temperature rise. The entire weight of the set is a little over 600 pounds, the engine constituting a little over 40 per cent of this weight. The field frame is attached directly to the engine frame and placed at floor level so as to be as stable as possible. This arrangement was facilitated by the adoption of the consequent pole type, giving a four-pole field with only two field coils. As these coils are placed on the horizontal pole pieces, the height of the shaft center is reduced to a minimum. The floor area occupied by this set is only 21 inches by 35 inches, and the height 30 inches. This type of lighting set is built in sizes for twenty-five, thirty-seven and fifty 16-C. P. lights.

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCOILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CARNER**; Tug **ABERVACH**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS**, **SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY**, **AMIRAL AUBE** and **MARSEILLAISE**.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH**, **AUSTRALIEN**, **POLYNESIEN**, **ARMAND-BEHIC**, **VILLE-DE-LACIOTAT**, **ERNEST-SIMONS**, **CHILI**, **CORDILLERE**, **LAOS**, **INDUS**, **TONKIN**, **ANNAM**, **ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER LE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS**, **CAEN**, **BREST**, **CHERBOURG**; Fast Steamers **TAMISE**, **MANCHE**, **FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREVNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **VETLNA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAU**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR**, **ARROGANT**, **FURIOUS**, **VINDICTIVE**, cruisers; **NIOBE**, **DIADOME**, **ANDROMEDA**, **EUROPA**, cruisers; **CANOPUS**, **GLORY**, **GOLIATH**, **ALBION**, **OCEAN**, iron clad ships; **ARGONAUT**, **ARIADNE**, **AMPHITRITE**, **SPARTIATE**, **HERMES**, **HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT** and **VICTORIA**, royal yacht; **CONDOR**

and **ROSARIO**, sloops; **GRESSY**, **ABOUKIR**, **SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE**, **FORMIDABLE** and **IRRESISTIBLE**, **VENERABLE**, **LON ON**, **BULWARK**, iron clad ships; **EURYALUS**, **BACHANTE**, cruisers; **MUTINE**, **RINALDO**, **SHEARWATER**, sloops; **CORNWALLIS**, **DUNCAN**, **EXMOUTH**, **RUSSEL**, iron clad ships; **DRAKE**, **KING ALFRED**, **LEVIATHAN**, **AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX**, **KENT**, cruisers; **ALBEMARLE**, **MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X'**, **X''**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, cruiser.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER**, **CORYELL**, **WILD DUCK**, **SULTANA**.

“WORTH LOOKING INTO.”

This is the latest effort of Henry M. Crouse, who is now with “The American Tool Works Co.,” Cincinnati, and who has done some notable catalogue work before this. “Worth Looking Into” is a 500-page catalogue of fine tools, issued by the F. W. Gesswein Co., No. 39 John street, New York, and will be sent to any of our readers for the asking. It shows the finest line of files we have ever seen, so arranged that size, shape and cut may be seen from the illustration. It is especially complete in tool makers’ and die sinkers’ files, and this feature alone will cause it to be valued in every machine shop. The list of tools is long and varied, and the book also contains many tables of information that cannot generally be found outside of engineers’ pocket books, such as Kent, Molesworth’s and other high-priced works. These tables have been brought up to date and make the catalogue valuable as a work of reference. If Mr. Crouse succeeds as well with the machine tool catalogue he is now engaged upon, his efforts should be extremely valuable to his present employers. We strongly advise all buyers, superintendents and machinists to send for one of these catalogues of the Gesswein company.

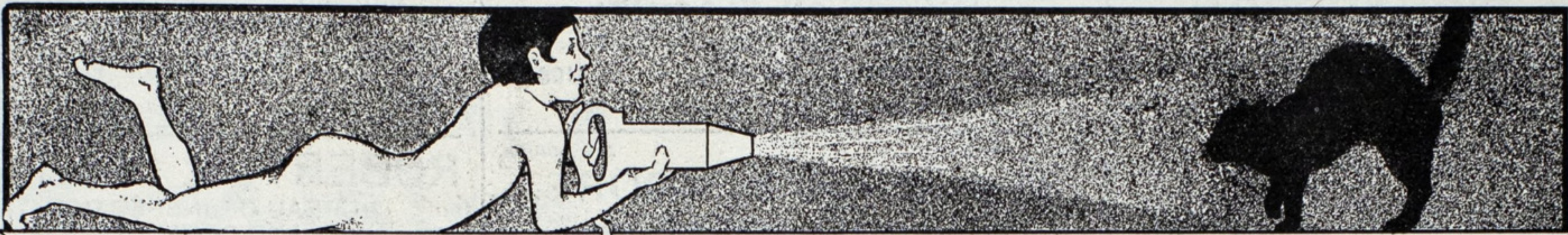
Much credit is due the Gesswein company in placing such a valuable work on the market, for the book is not only “Worth Looking Into,” but also “worth possessing.”

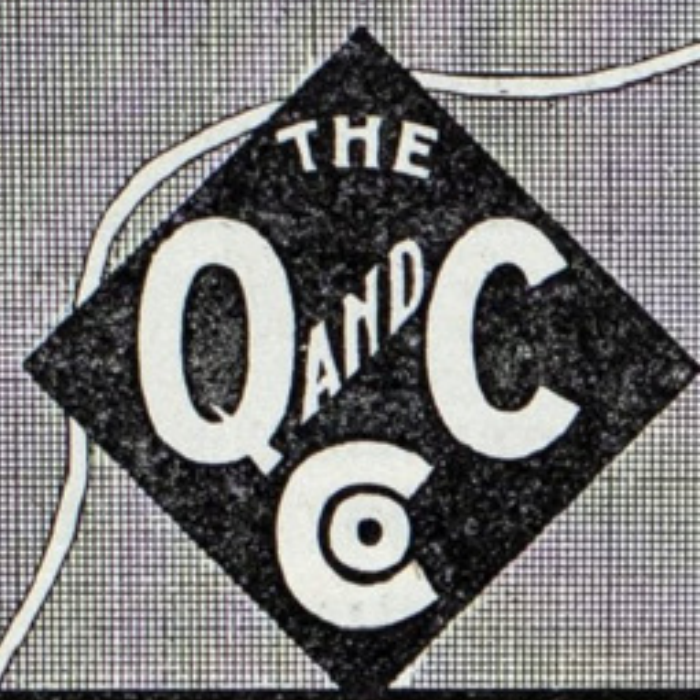
Joseph Lamoreux has been appointed harbor master at Chicago to succeed John Roberts.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.
Quotations furnished by HERBERT WRIGHT & Co., Cleveland,
date of Feb. 14. 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	58¼	58¾	58	58¼
American Steel & Wire, Pfd.....	93¼	93¾	93¼	93½
Federal Steel	56½	56¾	55¼	55½
Federal Steel, Pfd.....	76	76½	75	75
National Steel	51	51	50	50¼
National Steel, Pfd.....	.....	.....	.....	.....
American Tin Plate	35	35	34½	34½
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	47½	47½	47	47
American Steel Hoop, Pfd.....	85	85	84¾	84¾
Republic Iron & Steel	25¾	25¾	24¾	25
Republic Iron & Steel, Pfd.....	.....	.....	.....	.....

CAPT. GEO. A. SIMPSON, Expert Compass Adjuster,
19 YEARS EXPERIENCE.
Yearly Contracts Solicited. Nautical Instruments Repaired.
OLD 'PHONE No 319. SAULT STE. MARIE, MICH.





PNEUMATIC TOOLS

CAN BE USED EVERY WHERE

CHICAGO
NEW YORK

SEND FOR
CATALOG

A SPECIALTY:

TOWING
AND
SHIP'S
HAWSEERS
LINES

ROPE

THE AMERICAN MANUFACTURING CO.

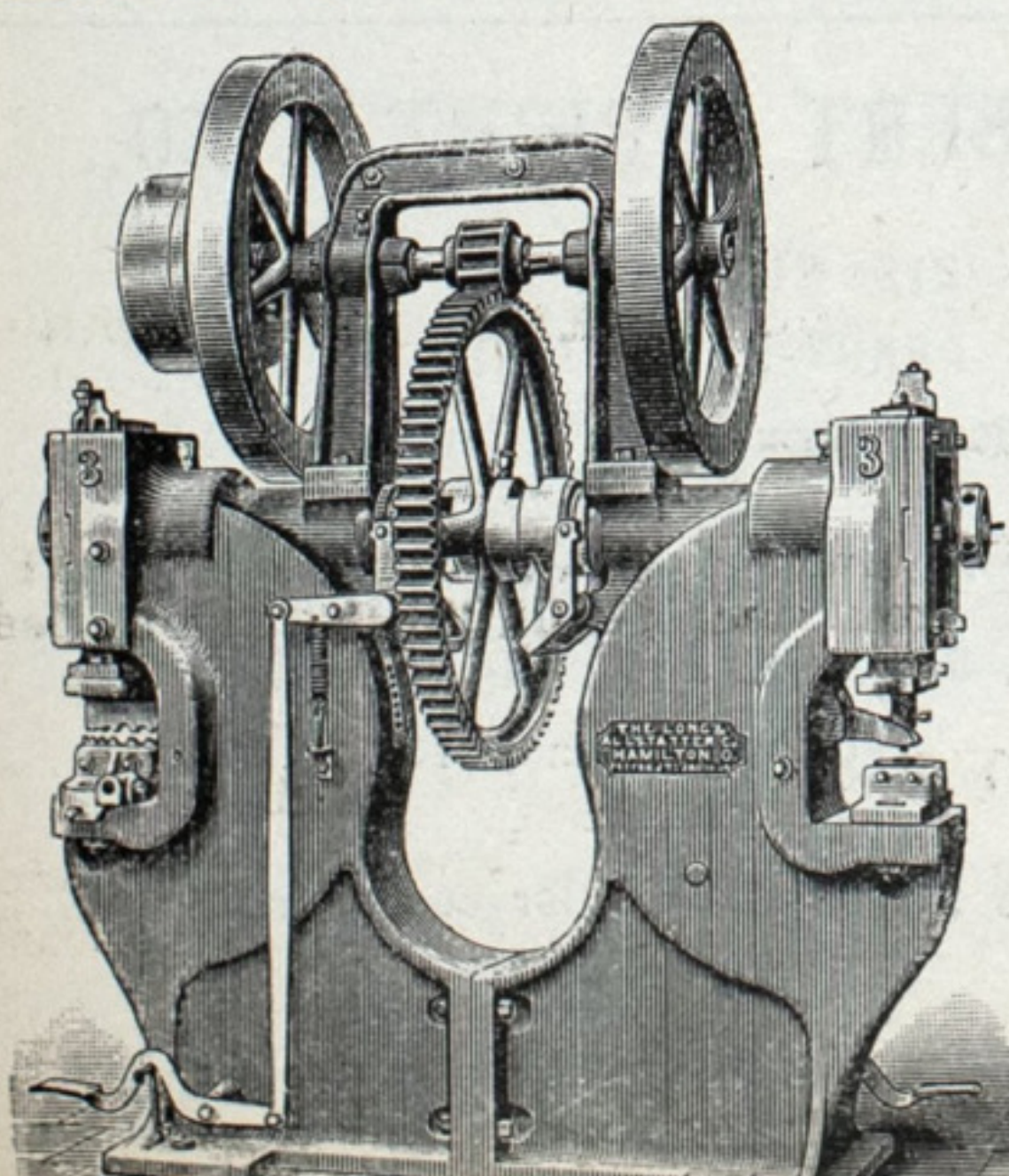
65 WALL STREET, NEW YORK.

THE LARGEST MANUFACTURERS OF FIBER IN THE WORLD.

A SPECIALTY:

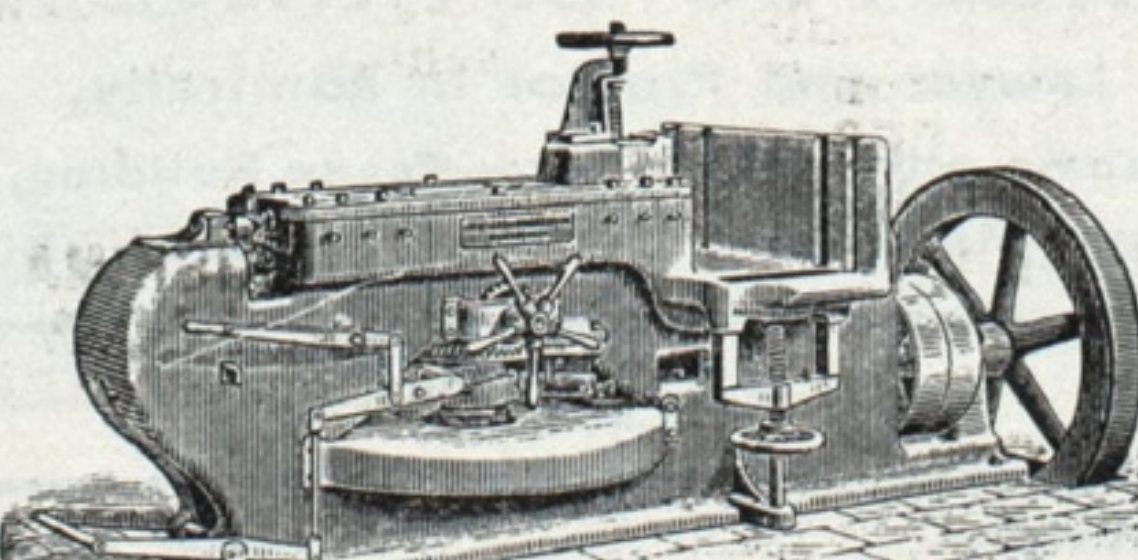
4-STRAND
PLUMBAGO
HEART
HOISTING
ROPE
FOR
CARGO FALLS

LABOR-SAVING



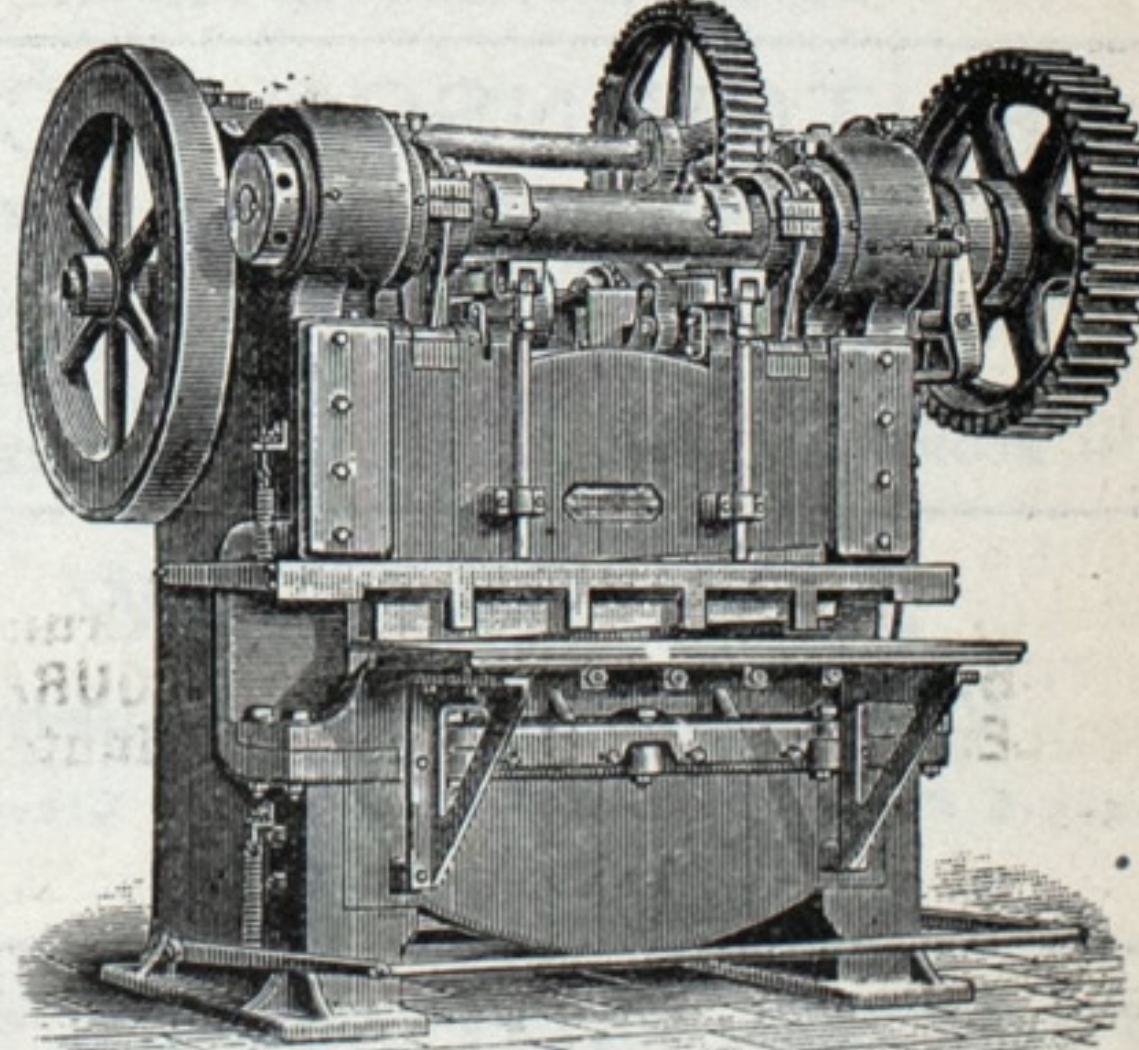
PUNCHES

NEW CATALOGUE
NOW READY.



MANUFACTURED BY

SHEARS



For All Kinds of Work.

THE LONG & ALLSTATTER CO., HAMILTON, OHIO.

VESSEL AND INSURANCE AGENTS.

C. W. ELPHICKE & CO.

Vessel and Insurance Agents,

Room 10, No. 6 Sherman St.,

W. ELPHICKE.
CALVIN CARR.

CHICAGO, ILL.

Long Distance Telephone, Harrison 1194.

JOHN MITCHELL. JOHN F. WEDOW. ALFRED MITCHELL.

MITCHELL & CO.

Vessel and Insurance Agents,

508, 509 & 510 Perry-Payne Building, Cleveland, O.

Office Telephone 767. Residence, John Mitchell, Doan 341.
John F. Wedow, 158 L. Alfred Mitchell, Doan 197 J.**F. H. OSBORN & CO.**

Marine Insurance Brokers,

12 SHERMAN ST., CHICAGO.

Long Distance Telephone, Harrison 1586.

W. C. RICHARDSON,

VESSEL AND MARINE INSURANCE AGENT,

Office Telephone 338. Residence Telephone 2938.

606 and 607 Perry-Payne Bldg., Cleveland, O.

BROWN & CO.J. J. H. BROWN.
J. B. ROIGERS.
EDWARD SMITH.

Vessel and Insurance Agents,

202 Main Street, Buffalo, N. Y.

H. J. PAULY,

General Ship Broker,

59 Chamber of Commerce, MILWAUKEE, WIS.

Telephone Main 369.

J. G. KEITH.

D. SULLIVAN.

J. G. KEITH & CO.

Vessel and Insurance Agents,

138-139 Rialto Building, CHICAGO.

Long Distance Telephone, Harrison, 1339.

JOHN B. HALL.

HARRY B. ROOT.

HALL & ROOT,

Vessel Agents,

Nos. 21 and 22 Exchange Building,

Telephone Seneca 892. BUFFALO, N. Y.

ALEX. McDOUGALL.
W. A. THOMPSON, JR.Telephone 89.
Cable Address: "Macduluth."**ALEX. McDOUGALL & CO.,**

DULUTH, MINN.

AGENTS FOR

Lake, River, Canal and Ocean Transportation,
and Marine Insurance.

M. M. DRAKE.

G. W. MAYTHAM.

DRAKE & MAYTHAM,

VESSEL AGENTS.

202 Main Street, BUFFALO, N. Y.

Telephone, Seneca 1660.

HUTCHINSON & CO.

Vessel and Insurance Agents.

Office Telephone, Main 2453.

Residence C. L. Hutchinson, W. 696 L.

Residence W. H. McGean, E. 198 J.

C. L. HUTCHINSON.

413-15 Perry-Payne Bldg.,

W. H. MCGEAN. CLEVELAND, O.

J. H. BARTOW,

Vessel and Insurance Agent

514-516 Perry-Payne Building, Cleveland, O.

TELEPHONE 717.

THOS. WILSON, Managing Owner

Wilson's Transit Line.

Gen Forwarder, Freight and Vessel Agent,

CLEVELAND, O.

VESSEL AND INSURANCE AGENTS.

SAMUEL HOLMES,

Steamship Offices,

For Selling, Chartering and Building all classes Steam Vessels.

Steam Vessel Circulars. Weekly Freight Circulars.

Morris Building, 66 & 68 Broad Street, NEW YORK.

MILLER, BULL & KNOWLTON,

Vessel Owners and

Steamship Agents,

32 Broadway, NEW YORK.

Agents New York & Porto Rico Steamship Company.

JOHN J. BOLAND,

Vessel and Insurance Agent,

BUFFALO, N. Y.

25 and 26 Exchange Bldg., 202 Main Street,

Telephone Seneca 115.

JAMES A. MYERS,

Insurance and Vessel Agent

Room 201, Royal Insurance Bldg., CHICAGO.

Long Distance Telephone, Harrison 107.

W. A. HAWGOOD.

J. W. MOORE.

HAWGOOD & MOORE,

Vessel and Insurance Agents,

Residence Phone, Doan 446—W. A. Hawgood.

Long Distance Tel. 2395.

608 Perry-Payne Building, CLEVELAND, O.

W. J. CONNERS,

OFFICES

BUFFALO,
CHICAGO,
MILWAUKEE
GLADSTONE

Contractor,

BUFFALO, N. Y.

PROCTORS IN ADMIRALTY.

HOYT, DUSTIN & KELLEY,

LAWYERS and

PROCTORS IN ADMIRALTY,

Offices, 702 Western Reserve Bldg., Cleveland, O.

White, Johnson, McCaslin & Cannon,ATTORNEYS AT LAW and
PROCTORS IN ADMIRALTY,

Blackstone Bldg., Cleveland O.

HARVEY D. GOULDER,

Lawyer and Proctor in Admiralty,

CLEVELAND, O.

ALBERT J. GILCHRIST,

PROCTOR IN ADMIRALTY,

604 Perry-Payne Building, CLEVELAND, O.

SAMUEL H. CROWL,

Attorney at Law and Proctor in Admiralty,

505 American Trust Building,

Phone Main 3579.

CLEVELAND.

ORESTES C. PINNEY,

Lawyer and Proctor in Admiralty,

Rooms 316 and 317 Perry-Payne Building,

Telephone Main 2585.

CLEVELAND, O.

PATENTS.

E. L. THURSTON.

ALBERT H. BATES.

THURSTON & BATES,

Counselors at Law in Patent Causes and

Solicitors of Patents,

1028 Society for Savings Bldg., CLEVELAND, O.

PROFESSIONAL.

W. J. WOOD, Naval Architect,
Ship Surveyor,
Consulting Engineer.Prepares designs or working drawings and specifications for
all classes of vessels and superintends construction and re-
pairs. Surveys damaged property and estimates cost of re-
pairs.Vessels designed—Twin S.S. Virginia, Steam Yacht Comanche,
Twin S.S. North West and North Land, I. W. Nicholas,
and many others, including Fire Boats, Tugs, Barges, etc.Complete plans furnished for
Steel Composite or Wooden Vessels.Office on Goodrich Dock, CHICAGO, ILL.
foot of Michigan Ave.,**Pittsburgh Testing Laboratory, Limited,**INSPECTING AND METALLURGICAL
ENGINEERS AND CHEMISTS,

1750 MONADNOCK,

CHICAGO.

325 WATER STREET,

PITTSBURGH.

18 SOUTH BROAD ST. PHILADELPHIA.

Inspectors of Shipbuilding Materials and Machinery.
Inspectors located at all mills, Physical and Chemical
Laboratories.

Tests of all kinds.

ROBERT W. HUNT & CO.BUREAU OF INSPECTION, TESTS
AND CONSULTATION.1121 THE ROOKERY, MONGH. BANK BLDG., 71 BROADWAY,
CHICAGO. PITTSBURGH. NEW YORK.Inspectors of Shipbuilding Material and Machinery. Inspec-
tors of all Materials. Duty Tests of Engines and Boilers.
Physical and Chemical Laboratories.**HORACE SEE,**Consulting Engineer
and Naval Architect,

1 Broadway, NEW YORK.

GUSTAV HILLMANN,

NAVAL ARCHITECT.

Designer of all classes of VESSELS.

470 Greene Ave., near Norstrand, Brooklyn, N. Y.

JOSEPH R. OLDHAM,

Engineer and Naval Architect.

Designs Steam Vessels, Marine Engines and Boilers,
and Superintends their Construction or Repairs.814 Perry-Payne Building, CLEVELAND, O.
Telephone, Doan 440, J.**ROBERT CURR,**CONSULTING SHIP BUILDER
and MARINE SURVEYOR,

56 Wade Building, CLEVELAND, O.

Telephone Main 2844. Residence, 32 Malcom Street.

Residence Telephone, W. 628 Y.

AMBROSE V. POWELL, C.E.

Consulting Engineer.

SPECIALTIES:—Designing and Construction of DRY DOCKS,
Harbor Works, Docks and Plants for Handling
Coal and Ore.

Office, 615 Chamber of Commerce, CHICAGO, ILL.

HERBERT WRIGHT & CO.,

No. 215, 216, 217, 218 and 219

PERRY-PAYNE BUILDING.

Telephones Main 2754, 2770 and 3541.

Up-town Office,

No. 811 NEW ENGLAND BUILDING.

Telephone Main 1273.

Every possible facility for conducting a
brokerage business in**STOCKS, BONDS, GRAIN, ETC.**

AIR COMPRESSORS

Rock Drills, Coal-Cutters, Air Lift Pump and Stone Channellers.

THE INGERSOLL-SERGEANT DRILL CO.,

CATALOGUES. Havemeyer Building, NEW YORK.

Steamboat Fuel at Ashtabula. LARGE SUPPLIES OF BEST QUALITY.

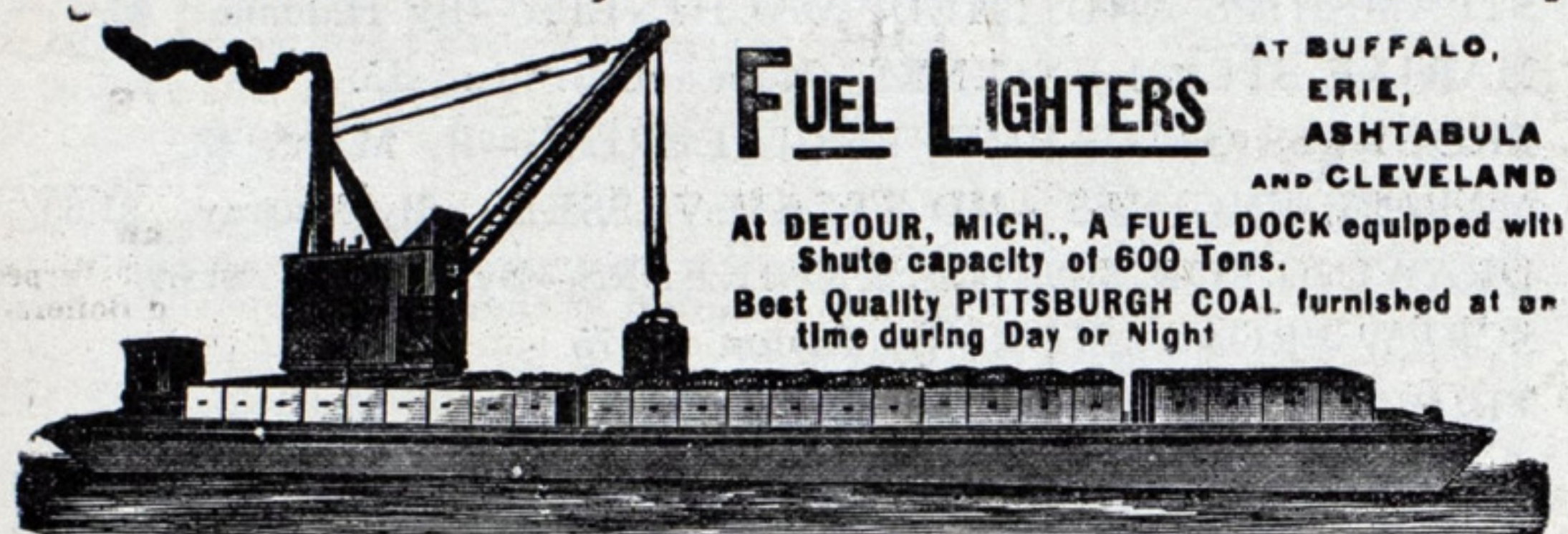
Lighter

**Carrying
Different
Grades
at all
Times.**



M. A. HANNA & CO., Miners and Shippers. Main Office, Perry-Payne Bldg., Cleveland.

Pickands, Mather & Co.,



Western Reserve Building, CLEVELAND, O.

FORE-AND-AFT COMPOUND MARINE ENGINE FOR SALE CHEAP.

Cylinders 16" and 32" diam. by 25" stroke. Now in course of construction. New patterns. Open front slipper-guide style.

BELL'S STEAM ENGINE WORKS,
PROMPT DELIVERY. **BUFFALO, N. Y.**
Feb. 15.

FOR SALE.

One 8x8 Vertical Marine Engine, one 20 H. P. Vertical submerged fue boiler, with heater, pump and fittings. This machinery has been in service less than four months—thoroughly overhauled, and good as new. Address The Root & VanDervoort Eng. Co., Champaign, Ill. Feb. 8.

FOR SALE—Steam Barge and Consort.

Steam barge classes A 1, carries 1,000 tons of coal, 33,000 bushels of corn or wheat, 900 tons of ore, or 600,000 feet of lumber on 12½ to 13 feet draught.

Tow barge classes A 2 and on 12½ to 13 feet of water carries 32,000 bushels of corn or wheat and 650,000 to 750,000 feet of lumber.

JOHN C. SPRY, 707 Chamber of Commerce, Chicago, Ill.
tf

FOR SALE.

Machinery from wrecked steamers St. Lawrence and H. A. Tuttle, consisting of engines, boilers, steam steering engines, steam windlasses, etc. For particulars inquire of

E. G. CROSBY & CO., Muskegon, Mich
tf

FOR SALE.

Steamer C. W. Moore. Built in 1881. Thoroughly rebuilt and steel arches put in, winter of 1892. Dimensions—125 feet keel, 25 feet wide, 9 feet moulded depth. As a barge she will carry 265M lumber. Engine 22 x 24 inches. Boiler 7 feet 6 inches x 14 feet. Of Otis steel and in good condition; allowed 95 pounds steam. Hoisting engine. Is a good all round boat. Come and look her over. If she suits, will make price right. Address H. W. Hart, Green Bay, Wis.
tf

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 24, 1900. Sealed proposals for Extension and Repair of Piers at White Lake, Mich., will be received here until 3 p. m., February 23, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 15.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., February 13, 1900. Sealed proposals for Extension and Repair of Piers at Frankfort, Mich., will be received here until 3 P. M., March 15, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt. Engrs. Mar. 8.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., February 13, 1900. Sealed proposals for Dredging at Harbors on East Shore of Lake Michigan will be received here until 3 P. M., March 15, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Mar. 8.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 29, 1900. Sealed proposals for Extension and Repair of Piers at Manistee, Mich., will be received here until 3 p. m., February 28, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 22.

THE Swain Wrecking Co.
L. C. WALDO, Pres.

The TUG FAVORITE
STATIONED AT CHEBOYGAN, MICH.
WITH COMPLETE WRECKING OUTFIT
IN CHARGE OF
Capt. Martin Swain

THE CANADIAN WRECKER, SAGINAW
STATIONED AT DETROIT, MICH.
ENABLES US TO WRECK IN CANADIAN WATERS

STEAM PUMPS AND SUB-MARINE WORK
IN CHARGE OF
JOHN S. QUINN
Address all communications to
PARKER & MILLEN
OFFICE IS AT WATER ST. WEST, DETROIT, MICH.

4 STEAM PUMPS, 10 JACKS, 3 HAWSERS.

1 COAL and ORE PUMP
3-12 INCH ROTARY.
1-14 INCH WORTHINGTON.

DIVING RIGS
AND
DIVERS
ABOARD
AT
ALL TIMES.

FEBRUARY						
S	M	T	W	T	F	S
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	...	...	...

10-100 TON JACKS.
1-12 INCH HAWSER.
1-10
1-9

Telegraph
Capt. MARTIN SWAIN,
CHEBOYGAN, MICH.

**TELEGRAPH
PARKER & MILLEN,**
DETROIT, MICH.

BOOKS ON MARINE ENGINEERING, ON THE OPERATION OF ENGINES AND FOR BEGINNERS IN THE ENGINE ROOM.

ARITHMETIC OF THE STEAM ENGINE—E. S. Gould. \$1.
 STEAM BOILERS—Joshua Rose. Practical treatise on construction and examination—Seventy-three engravings. \$2.
 AIDS TO ENGINEERS' EXAMINATIONS, with Questions and Answers.—N. Hawkins. Summary of principles and practice of steam engineering; prepared for applicants of all grades. \$2.
 REED'S ENGINEERS' HAND BOOK—New edition; illustrated by 345 diagrams and 36 large plates. \$5. REED'S GUIDE. \$5.
 REED'S KEY to Reed's Hand Book—Contains working of all questions given in examination papers. \$3.
 KEY TO ENGINES AND ENGINE RUNNING—Joshua Rose. For use of those desiring to pass examination to take charge of an engine or boiler. \$2.50.
 THE SLIDE VALVE, SIMPLY EXPLAINED—W. J. Tennant. \$1.
 WATER TUBE BOILERS—Fourth revised and enlarged edition of HOW TO RUN ENGINES AND BOILERS—E. P. Watson. Practical instruction for young engineers and steam users. \$1.
 ROOPER'S ENGINEER'S HANDY BOOK for Steam Engineers and Electricians. Revised and enlarged. \$3.50.
 MARINE ENGINEER AND GUIDE BOOK—Bergen. \$5.
 STEAM AND THE MARINE STEAM ENGINE—Jno. Yeo. \$2.50.
 MARINE STEAM ENGINES—Sennett & Oram. \$6.
 STEAM—Wm. Rupper. Cloth bound, 80 cents; half leather, \$1.
 POCKET BOOK OF MARINE ENGINEERING, RULES AND TABLES—Seaton and Rounthwaite. For marine engineers, naval architects, superintendents and others engaged in construction of marine machinery. \$3.
 A MANUAL OF MARINE ENGINEERING—A. E. Seaton. Designing, construction and working of marine machinery; standard for reference among marine books. \$6.
 PRACTICAL ADVICE FOR MARINE ENGINEERS—C. W. Roberts. 64 illustrations. \$1.
 MARINE BOILER MANAGEMENT AND CONSTRUCTION—C. E. Stromeyer. \$5.
 BREAKDOWNS AT SEA AND HOW TO REPAIR THEM—A. R. Leask. 252 pages. \$2.

ELEMENTARY LESSONS IN STEAM MACHINERY—Langmaid and Galsford. For students and subordinates in marine engineering. \$2.
 USEFUL HINTS TO SEAGOING ENGINEERS—How to avoid and repair breakdowns. \$1.40.
 ENGINEER'S MANUAL—By Ainsley. \$5.
 MARINE PROPELLERS—By Barnaby. \$4.25.
 ELEMENTARY ENGINEERING—By Brewer. 60 cents.
 MODERN MARINE ENGINEERING—By Burgh. \$10.
 TREATISE ON SCREW PROPELLERS—By Chase. \$3.
 AMERICAN MARINE ENGINEER—By Edwards. \$2.50.
 MODERN AMERICAN MARINE ENGINES—By Edwards. \$5.
 CATECHISM OF THE MARINE STEAM ENGINE—By Edwards. \$2.00.
 STEAMSHIPS AND THEIR MACHINERY—By Haldane. \$6.
 MARINE STEAM ENGINES—Main and Brown. \$5.
 PROGRESS OF MARINE ENGINEERING—By Main. \$3.
 MARINE ENGINES AND STEAM VESSELS—By Murray. \$1.60.
 DRAWING FOR MARINE ENGINEERS—By Thorne. \$1.50.
 SCREW PROPULSION—By Taylor. \$3.75.
 TRIPLE EXPANSION ENGINES—By Wingate. \$1.
 KEY TO ENGINEERING, WHAT AN ENGINEER SHOULD KNOW ABOUT ELECTRICITY and ENGINEER'S EPI-TOME—Three excellent little books for marine engineers. 50 cents each, or the three for \$1.
 LESSONS AND PRACTICAL NOTES ON STEAM, THE STEAM ENGINE, PROPELLERS, ETC.—By King. \$2.
 ELECTRIC LIGHTING FOR MARINE ENGINEERS—S. F. Walker. \$2.
 ENGINE ROOM PRACTICE—John Leveridge. \$2.50.
 BREAKDOWNS—Thos. Reed. \$1.50.
 A TEXT BOOK ON MARINE ENGINEERING—A. E. Tompkins. \$3.50.

BOOKS ON NAVAL ARCHITECTURE, ON SHIP YARD PRACTICE, SEAMANSHIP, ETC.

NAVAL ARCHITECTURE: A MANUAL ON LAYING OFF IRON AND STEEL VESSELS—Thos. H. Watson. Valuable for naval architects as well as beginners in ship yards. \$5.
 THEORETICAL NAVAL ARCHITECTURE—E. L. Attwood. Text book; 114 diagrams. \$2.50.
 KNOW YOUR OWN SHIP—Thos. Walton. \$2.50.
 PRACTICAL MARINE SURVEYING—Harry Phelps. \$2.50.
 SHIPBUILDING: THEORETICAL AND PRACTICAL—Rankins and Barnes. \$40. This book is now out of print and very scarce.
 RESISTANCE AND PROPULSION OF SHIPS—By Taylor. \$3.75.
 NAVAL ARCHITECTURE—J. J. Welch. New edition. Out soon.
 STABILITY OF SHIPS—Sir E. J. Reed. \$8.40.
 NAVAL SCIENCE—Sir E. J. Reed. Complete set of four volumes; half morocco. \$20.
 STEAM YACHTS AND LAUNCHES—By Kuhnhardt. \$3.

STEAMSHIP CAPABILITY—By Wingate. \$1.
 MODEL ENGINES AND SMALL BOATS—N. M. Hopkins. New methods of engine and boiler making; ship design and construction; fifty illustrations. \$1.25.
 TEXT BOOK OF SEAMANSHIP—Com. S. B. Luce, U. S. N. Equipping and handling of vessels under sail or steam. \$10.
 HINTS ON LEGAL DUTIES OF SHIPMASTERS—B. W. Ginsburg. \$1.75.
 SUBMARINE BOATS—By Hovguard. \$2.
 STEAM VESSELS AND MARINE ENGINES—By Howell. \$5.
 NAVAL ARCHITECTURE—Sir W. H. White. New edition ready about March.
 NAVAL ARCHITECT'S AND SHIPBUILDER'S POCKET BOOK—Clement Mackrow. Formulae, rules and tables, and marine engineers' and surveyors' Handy Book of Reference. Fifth edition. 70 pages; pocket-book form. \$5.

SENT TO ANY ADDRESS, CARRIAGE PREPAID, AT PRICES NAMED.

THE MARINE REVIEW PUB. CO.

PERRY-PAYNE BLDG., CLEVELAND.